A Review of the 1985 Chum Salmon Season in the Johnstone Strait - Fraser River Study Area

L. Hop Wo, A.P. Gould and M. Farwell

Department of Fisheries and Oceans
Fisheries Branch
South Coast Division
3225 Stephenson Point Road
Nanaimo, British Columbia V9T 1K3

April 1987

Canadian Technical Report of
Fisheries and Aquatic Sciences
No. 1524

Fisheries and Oceans Pêches et Océans

Canada

Canadian Technical Report of Fisheries and Aquatic Sciences

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E R R A T A

Hop Wo, L., A.P. Gould and H. Farwell. 1987. A review of the 1985 chum salmon season in the Johnstone Strait - Fraser River Study Area. Can. Tech. Rep. Fish. Aquat. Sci. 1524: 54p.

Page vii, line 24 and page 8, line 43 should read 161,000 instead of 164,000.

Page 9, line 6 should read 136,000 instead of 138,000.

Page 22, table 12 for years 1980, 1983 and 1984 should read:

1980	143,185	201,090	344,275	136,026	140,763	276789
1983	796	844	1,640	756	591	1347
1984	92,702	68,236	160,938	88,067	47,765	135832

Page 24, table 14 for years 1980, 1984, 1985 and averages for 1980-1985 and 1960-1985 should read:

1980	787,300	276,789	1,311,000	2,375,100	44.8%
1984	272,600	1,347	1,564,400	1,838,300	14.9%
1985	1,872,600	135,832	2,459,000	3,667,400	33.0%
AVERAGES					
1980-1985	671,267	80,792	1,539,133	2,291,167	29.2%
1960-1985	641,919	82,045	1,145,808	1,869,762	32.3%

Page 25, table 15 for years 1975 to 1977, 1979 to 1982, 1984, 1985 and averages should read:

1975	672320	575327	1247647	437500	409661	19001	866162	50.5	47.3	2.2	1.29
1976	939918	1170829	2110747	317946	1686305	97639	2101890	15.1	80.2	4.6	2.24
1977	1433100	207614	1640714	672147	1163031	131734	1966912	34.2	59.1	6.7	1.37
1979	774352	99126	873478	605977	824554	82725	1513256	40.0	54.5	5.5	1.95
1980	1310988	1064090	2375078	258134	845633	80684	1184451	21.8	71.4	6.8	0.90
1981	1292138	171715	1463853	984460	2218805	349428	3472693	26.8	63.9	10.1	2.69
1982	1415019	1512404	2927423	1367957	3016115						
1984	1564357	273976	1838333								
1985	2458965	1208481	3667446								
AVERAGE:	1095733	744359	1840092	450030	1314515	113322	1877867	28.8	66.7	4.6	1.9
EVEN YRS:	1185784	900856	2086640	457383	1591191	135054	2113584	21.2	74.0	4.8	1.9
ODD YRS:	1011310	597644	1608954	500243	1057601	73429	1519471	36.5	59.5	4.0	1.8

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L. Hop Wo, A. P. Gould and M. Farwell[2]

Department of Fisheries and Oceans
Field Services Branch
South Coast Division
3225 Stephenson Point Road
Nanaimo, British Columbia
V9T 1K3

[2]Fraser River
Northern British Columbia and Yukon Division
80 - 6th Street
New Westminster, British Columbia
V3L 1B3

90-00769/

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Cat. No. Fs 97-6/1524E ISSN 0706-6457

Correct citation for this publication:

Hop Wo, L., A.P. Gould and M. Farwell. 1987. A Review of the 1985 chum salmon season in the Johnstone Strait - Fraser River Study Area. Can. Tech. Rep. Fish. Aquat. Sci. 1524: 54p.

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ABSTRACT

Hop Wo, L., A.P. Gould and M. Farwell. 1987. A review of the 1985 chum salmon season in the Johnstone Strait - Fraser River Study Area. Can. Tech. Rep. Fish. Aquat. Sci. 1524: 54p.

Management of the Johnstone/Georgia straits and Fraser River chum salmon during the 1985 season consisted of three main objectives: 1) stock assessment procedures; 2) harvest management strategies, and; 3) catch allocation.

The pre-season stock expectation was projected to be 2,468,000 chum. The first in-season assessment, provided on September 20, estimated the total returning stock at 2,625,000 chum with further assessments updating the stock to 2,920,000 chum. Stock identification analysis of upper Johnstone Straits samples revealed a high percentage of Fraser stocks early in the season while non-Fraser stocks were dominant later. American origin stocks were most abundant during mid-season.

Commercial fisheries occurred the second week of October in Johnstone Strait and the Fraser River with chum catches of 399,000 and 37,000, respectively. Commercial fishing in the Mid Vancouver Island area commenced during the second week of October and continued until late November. Catches totalled 527,000 chum in this fishery. An additional Fraser River fishery occurred late in November harvesting approximately 7,000 chum.

Commercial fisheries in Washington State Statistical Areas 7 and 7A occurred late in October and harvested a total of 164,000 chum.

The catch of Study Area chum totalled 1,211,000.

The 1985 Study Area chum spawning escapements were the highest recorded since 1950. The Fraser River and Mid-Vancouver Island stocks accounted for 54% of the total escapement.

The total stock size was 3,670,000 and was the largest since 1972. The total harvest rate of Study Areas chum was 33.0%. Canadian harvesting accounted for 88.6% of the total Study Area catch.

Key words: Chum salmon, management, Johnstone Strait, Fraser River, exploitation.

RESUMÉ

La gestion de la pêche du saumon kéta dans les détroits de Johnstone et de Géorgie ainsi que dans le fleuve Fraser pendant la saison 1985 visait trois objectifs: 1) des méthodes d'évaluation du stock, 2) des stratégies de gestion de la pêche et 3) l'allocation des prises.

Selon les prévision pré-saisonnières, le stock totalisait 2 468 000 saumon. La première évaluation en saison, effectuée le 20 septembre, fixait le total des géniteurs amontants à 2 625 000 kéta; des évaluations ultétieures ont porté ce total à 2 920 000 saumon. Une analyse d'identificaton du stock menée à l'aide d'échantillons recueillis dans la partie supérieure du détroit de Johnstone a révélé un pourcentage élevé de stocks du Fraser au début de la saison, tandis que les autres stocks dominaient plus tard. Les stocks provenant des eaux américaines étaient plus abondants à la mi-saison.

Des pêches commerciales ont eu lieu pendant la deuxiéme semaine d'octobre dans le détroit de Johnstone et le fleuve Fraser où les captures ont totalisé respectivement 399 000 et 37 000 kéta. Dans la région centrale de l'Île de Vancouver, la pêche commerciale a commencé pendant la deuxième semaine d'octobre et s'est poursuivie jusqu'à la fin novembre; au cours de cette période, les captures ont totalisé 527 000 saumon kéta. À la fin novembre, on a capturé environ 7 000 kéta au cours d'une autre pêche dans le fleuve Fraser.

Dans les secteurs statistiques 7 et 7a de l'État de Washington, 164,000 kéta ont été capturés au cours de pêche commerciales effectuées à la fin d'octobre.

Les prises de kétas dans la zone d'étude s'élevaient à 1 211 000 poissons.

Dans cette zone, les échappées de kétas en 1985 ont été les plus élevées depuis 1950. Les stocks du Fraser et des eaux de la partie centrale de l'Île de Vancouver constituaient 54 % de l'échappée totale.

L'effectif global du stock s'élevait à 3 670 000 saumon, soit le plus élevé depuis 1972. Le taux d'exploitation total du kéta se situait à 33,0 % dans la zone d'étude tandis que les caputres canadiennes constituaient 88,6 % des prises totales.

Mots-clés: saumon kéta, gestion, détroit de Johnstone, fleuve Fraser, exploitation.

INTRODUCTION

The status of chum salmon stocks returning to the Johnstone Strait - Fraser River Study Area has been reviewed periodically since 1961. This report, the twenty-first in the series, describes the 1985 fisheries management objectives, in addition to reviewing the 1985 chum fishing season.

The Study Area, consists of Johnstone Strait, the Strait of Georgia and Fraser River regions, and has been divided into thirteen major sub-areas (Fig. 1). There are approximately 120 major spawning streams contributing to the Study Area chum salmon stock. Most of the chum stocks migrate to these streams from the north approach via Johnstone Strait.

Until 1985, expectations and fishing plans were developed and reviewed following consultation with the Johnstone/Georgia Strait/Fraser River Chum Salmon Advisory Committee. In 1985, using the nucleus of the Chum Advisory Committee, the South Coast Advisory Committee was formed to allow broader consultation on all salmon species. This new committee is composed of commercial fisherman, processors, and sports fishermen. Commercial fishermen represent gillnet, seine and troll interests from the Fraser River, Strait of Georgia and Johnstone Strait regions, and the West Coast of Vancouver Island. The committee reviews potential fishing plans with the Department of Fisheries and Oceans (DFO) staff and develops regulatory proposals for the current season's fishery.

This report discusses three main issues. The first comprises the commercial fishery management objectives including stock assessment, harvest strategy and catch allocation. The second issue details the methods used to achieve the management objectives and includes procedures employed for in-season stock assessment. The pre-season and in-season assessment methods used in each of the Study Area's three major fisheries: Johnstone Strait, Fraser River, and Mid Vancouver Island are discussed. The last issue describes the results of management action and stock assessment, including catch, escapement, total stock size, and harvest rate.

MANAGEMENT OBJECTIVES AND CONSIDERATIONS

Chum management objectives and goals were extensively reviewed during the period 1982 to 1984 in consultation with Johnstone/Georgia Strait/Fraser River Chum Salmon Advisory Committee and subsequently with the South Coast Advisory Committee in pre-season 1985. This review process resulted in a defining of stock rebuilding objectives and harvest strategies collectively referred to as the "clockwork plan" (Gould and Hop Wo 1987; Hilborn and Luedke 1987). In 1985, the additional objective of a domestic allocation of catch by fishing gear types was added to the management plan. Therefore, the three major areas of consideration in planning the season were: (1) the clockwork approach; (2) stock assessment; and (3) catch allocation.

(1) The Clockwork Plan

This plan, initially developed and refined during the period 1982 to 1984, consists of a harvest management strategy and predefined stock assessment rules for input into the management strategy. The primary objective of the clockwork plan is to rebuild wild chum stocks to optimum escapement levels by limiting the total harvest rate. The harvest rate is calculated based on the combined catches from Johnstone Strait, the Fraser River and the U.S. Areas 7 and 7A. The optimum escapement objective for Study Area chums, although, not rigorously determined was set at 2.5 million chum including a Fraser River escapement of 700,000. Other management objectives were: (a) to achieve the rebuilding objective within 12-15 years (3 cycles); (b) to reduce the number of years during which no commercial chum fisheries would occur in Johnstone Strait and the Fraser River and; (c) base harvest management plans on wild stock production.

The harvest management strategy selected to best achieve the above objectives was a variable rate harvest strategy, which included no directed commercial harvesting if the total returning Study Area stock was assessed to below a threshold level of 2.6 million chum. The allowable harvest rates for various stock sizes were: (a) 0 - 2.6 million chums, up to a 10% incidental harvest rate; (b) 2.6 million to 3.3 million, maximum 20% harvest; (c) 3.3 million to 4.9 million, maximum 30% harvest; (d) greater than 4.9 million, maximum 40% harvest. These harvest rates were selected so that wild chum stocks would rebuild while still providing fishermen limited opportunities to harvest chums.

The clockwork plan was developed as a type of "skim fishery" for limited harvesting in mixed stock interception areas, however, it was recognized terminal harvesting in some areas would be required. Terminal harvesting of identified surpluses, particularly those enhanced returns to the Mid Vancouver Island area were also detailed in a separate clockwork strategy (Gould and Hop Wo 1987).

(2) Stock Assessment

The estimation of the magnitude of the returning chum run, is of critical importance in managing the fishery. Several stock size estimation procedures are used within the clockwork frame to determine run size. These are divided into two categories: those occurring prior to the chum season (pre-season) and those used during the season (in-season).

The pre-season assessment procedures forecast the expected stock size using historical escapement, age and survival rate information with separate forecasts developed for wild and enhanced chum. The stock size prediction of wild Study Area chum is based on brood year escapement data, average rates of the return by age, combined with environmental survival indices. Fraser River wild chum forecasts are developed separately using similar methods combined with fry output calculations.

Enhanced return predictions use hatchery and channel survival bio-standards for fry to adult return ratios applied to individual facility fry output data. These calculations are developed for major enhancement facilities, community run chum projects, and other minor enhancement facilities. An additional stock group which utilizes the Study Area as a migration route and which adds to the total abundance are the American origin chum. Knowledge of the diversion rate through Johnstone Strait and the magnitude and behaviour of this stock in Johnstone Strait is limited. The current pre-season estimate of American chum abundance has been fixed at 100,000 chum for computational purposes in run size forecasting.

Wild and enhanced stock size estimates are combined with the American estimate to provide the pre-season expectation of the total stock size. This estimate provides the commercial fishing industry with a forecast of the probable harvest levels for the season.

In-season stock assessment provides the means for refining the estimated seasonal run size and consequently establishing the allowable harvest rate and subsequent catch level. There are several in-season assessment methods used to determine stock size which incorporate commercial and test fishing catches in Johnstone Strait and the Fraser River. In-season stock size assessments are updated weekly during the season.

The first in-season stock size update used to determine if commercial fisheries in Johnstone Strait, the Fraser River, and by agreement in the U.S. Areas 7 and 7A, will occur is based on the analysis of early season commercial catches during September in Johnstone Strait. This commercial catch analysis compares current and past weekly catches with the associated total chum run size to derive an estimate of the current season's expected total stock size. This first in-season estimate is calculated following the third week of September commercial catch (Gould and Hop Wo 1987).

The analysis of weekly test fishing data in the upper Johnstone Strait area provide further stock size estimates. The procedure involves comparisons of current and past weekly test catches to derive an estimate of the total stock size. During 1985, an additional test fishing program was initiated in upper Johnstone Strait to confirm existing test catches and assess the total run size independently. The weekly test fishing estimates and the previous commercial catch estimate (first in-season estimate) are averaged to determine the estimated in-season stock size. The updated estimated run size is used to determine the overall harvest rate and requirements for further harvesting.

Stock identification is conducted in conjunction with test fishing in Johnstone Strait, the Mid Vancouver Island area, and in Juan de Fuca Strait. The current stock identification program uses electrophoretic protein separation (Beacham et al. 1983) and age class analysis as determined by scale readings. Chum are sampled weekly from the test fishing vessels, analysed and identified as percentage Fraser River origin, Canadian non-Fraser, or U.S. stocks. The Johnstone Strait data are not used in-season in the management decision making process in Johnstone Strait. However, Mid Vancouver Island area data are an integral part of the terminal management plan.

The Mid Vancouver Island management policy dictates that no commercial chum fisheries will occur if there is a greater than 10% occurrence of Fraser River chums in any specific sub-area. Chum samples are obtained prior to any proposed commercial openings and analyzed for Fraser River stock presence. Sub-area openings are adjusted accordingly.

(3) Catch Allocation

The Ministerial Advisory Council (MAC) recommended that the Minister of Fisheries and Oceans adopt a plan of fixed commercial chum allocations to the three major gear types for 1985. For the South Coast/Fraser River area the final chum allocation adopted was based on the 1981 catch distribution of: gillnet 39.2%; seine 55.6%; and troll 5.2%. The catch allocation generally resulting from traditional fishing patterns in the combined Johnstone Strait and Fraser River areas was projected to be 25% gillnets and 75% seines. Therefore, in order to meet allocation requirements, the Mid Vancouver Island area fishery was planned as primarily a gillnet fishery.

1985 PRE-SEASON STOCK ASSESSMENT RESULTS

Stock Size

The pre-season expected total return to the Study Area for 1985 was 2,468,000 chum. This included approximately 1.5 million wild; 900,000 enhanced; and 100,000 American origin chum (Table 1). Of the total wild production, 501,800 were expected to be of Fraser River origin. As the expected pre-season chum return did not exceed the 2.6 million clockwork threshold, a Johnstone Strait or Fraser River commercial chum fishery was not anticipated. However, a surplus of 403,000 enhanced chum was expected in the terminal Mid Vancouver Island area (Table 2), and a substantial commercial fishery was anticipated. Table 3 reviews pre-season predictions and actual total Study Area chum returns from 1969 to 1985.

1985 IN-SEASON STOCK ASSESSMENT RESULTS

(1) Johnstone Strait Stock Size

The first in-season forecast of total run size using Johnstone Strait commercial fishery catches for the third week of September updated the total run size to 2.62 million chum (Table 4). This forecasted abundance exceeded the threshold 2.6 million and therefore the seasonal harvest rate was set at 20%. It was expected that a one day fishery for both Johnstone Strait and the Fraser River areas would produce a 20% harvest rate. The results of the Johnstone Strait test fishing program to the first week of October provided the second in-season chum stock size update of 2.92 million. This

confirmed an allowable 20% harvest rate and after discussions with the South Coast Advisory Committee a one day opening was scheduled for the second week of October in Johnstone Strait (October 6-7). The chum directed commercial harvest in the Fraser River was to be scheduled at a later date and be based on terminal area stock abundance.

Test fishing to the end of the second week of October indicated a total stock size of 2.98 million chum, with results to the end of the third week decreasing the total stock size to 2.97 million. The Johnstone Strait summary test fishing results for the three areas tested are presented in Table 5. Complete details are presented in Appendix A.

(2) Johnstone Strait Stock Identification

The composition of the stock in Johnstone Strait was determined using electrophoretic analysis of weekly samples. Chum were sampled from the upper Johnstone Strait test fishing vessel and revealed a high percentage of Fraser River stocks early in the season with a building percentage of non-Fraser stocks towards the end of the season (Table 6). In addition, American stocks were most prevalent during mid-season. These electrophoretic stock identification results are similar to stock compositions reported by Anderson and Beacham 1983 and by Beacham et al. 1985.

Appendix B details the age class analysis of the 1985 chum run in Johnstone Strait as determined from scale analysis. Scale samples from both the upper and lower Johnstone Strait test fishing vessels exhibit a higher three year old component later in the season. Weekly scale determined age results are weighted by abundance using test fishing catch data to reflect an annual Study Area age structure. A comparison to historic data is presented in Appendix C.

(3) Fraser River

The pre-season forecast for the total return of Fraser River chum was approximately 767,000. As the season progressed, it became evident that the total Study Area chum run was larger than predicted, and the return to the Fraser was assumed to be proportionately larger. The final in-season estimate of 2.97 million chum entering Johnstone Strait was assumed to contain approximately 930,000 Fraser chum.

This larger than expected return of Fraser River chum could not be confirmed until the run began entering the Fraser River. Test fishing at two sites, Cottonwood and Albion, began October 1 and indicated above average chum abundance throughout the early portion of the run. By mid November the test fishery data predicted an escapement of approximately 760,000. An unusual and prolonged period of cold weather interrupted test fishing from November 20 to mid December and further test fish information on the number of chum entering the Fraser River was not available. Appendix D summarizes the seasonal total test fishing data for Albion and Cottonwood.

(4) Mid Vancouver Island Stock Size

The Mid Vancouver Island area (Area 14) stock size prediction is comprised primarily by the pre-season expectations from three major enhancement facilities, Big Qualicum, Little Qualicum, and Puntledge rivers, plus a forecast of wild returns (Fig. 2). The pre-season enhanced forecast of 608,000 chum and an expected 105,000 wild returning chums to the area remained constant for management purposes throughout the season which presented a management problem as the total run increased in size. The resultant effect was a greater chum harvest in the "clean-up" fishery in late November than was anticipated or desired.

(5) Mid Vancouver Island Stock Identification

The Mid Vancouver Island clockwork management plan stipulated that any harvest areas having a Fraser River stock component in excess of 10%, as determined by electrophoretic analysis, should not be opened to commercial fishing. In-season sub-area sampling of the Mid Vancouver Island fishing area for stock identification was conducted prior to all commercial harvesting (Table 7).

The in-season stock identification data indicated that commercial harvesting in the "outside" areas of sub-Areas 14-9 and 14-10 and the offshore Areas of 14-5 and 14-4 (seaward of eight kilometers offshore) would have higher incidental harvests of Fraser River chum salmon than the authorized 10%. These outside areas were not opened for commercial harvesting in 1985 with the exception of the late "clean-up" fishery, when most Fraser stocks would have migrated through the Mid Vancouver Island Area.

THE 1985 FISHERY

Several changes have been made to the method of compiling chum data for the 1985 report. It should be noted that previous reports have included data from summer chum runs. Catches of these stocks occur as incidental catches in sockeye-pink directed fisheries in Johnstone Strait during July and August. The 1985 report excludes summer chums from statistical areas 11 to 19 and presents fisheries and escapement data for fall chums which are present after the beginning of September. The two major summer run chum streams excluded from the escapement are the Ahnuhati and Orford Rivers. Historical data has been updated accordingly.

Commercial catches for Johnstone Strait have previously included passing U.S. stocks. Using electrophoretic results applied to the in-season catch data, estimates of U.S. origin chum have been excluded from the 1985 total catch. Historic stock identification data from 1982-84 has also been used to reassess past commercial catches.

The majority of the catch of Study Area fall chum occurs in three major types of fisheries: Canadian commercial and Indian food, and American fisheries. Commercial fisheries in Johnstone Strait, Fraser River, and the Mid Vancouver Island Areas contribute to the bulk of the total Study Area chum catch. The final reported commercial catch statistics are based on catch data calculated using sales slips (British Columbia Catch Statistic, DFO publications). The commercial catch for fall chum is summarized by statistical area and detailed by time period in Table 8. During the season catch data is derived from a projection based on sales slip and hail data as complete sales slip data does not become available until after the season. All in-season management of Study Area chums is therefore based on hail type data. The observed differences between the two sets of catch data for 1985 are presented in Table 9.

The Study Area chum catch, including commercial, Indian food, and American fisheries (Canadian stock component only), totalled 1.21 million for 1985. The majority of the catch (90.5%), occurred in Canadian commercial fisheries, primarily in Areas 12 through 14.

(1) Canadian Commercial Fisheries

The total allowable catch for the Johnstone Strait and Fraser River commercial fisheries is calculated based on the in-season total stock size estimate as detailed in the clockwork plan. The in-season stock size estimate of 2.92 million (Table 4) chum produced on October 4 indicated that fisheries in Johnstone Strait and the Fraser River were warranted by the clockwork management strategy. The plan indicated a 20% harvest rate or a total catch of 584,000 chums for all fisheries combined.

Based on the estimated stock size, one day fisheries in Johnstone Strait and the Fraser River were expected to harvest the allowable catch.

The Johnstone Strait fishery occurred on October 6-7 in Area 12 and 13 for gillnets and seines (Table 8). The total catch for this fishery was 398,700 chums and represented the largest single day catch of chum salmon to date. The Johnstone Strait fishery was closed for the balance two weeks later without further commercial harvesting.

Landings by gear type are detailed in Table 10. Gillnet harvests in Johnstone Strait (Areas 11-13), represented 11.2% of the overall fall harvest; seines harvested 88.0%. The overall percent catch between the three major commercial gear types was gillnet 32.5%; seine 67.0%; and troll 0.5%. The recommended catch allocation from MAC of gillnet 39.2%; seine 55.6%; and troll 5.2% was exceed by seine gear. This imbalance in favour of seines was largely due to the higher than anticipated catch in the clean up fishery at Qualicum.

On October 9, the International Pacific Salmon Fisheries Commission opened the Fraser River for a one day harvest of pink salmon. The incidental harvest of chum salmon in the opening was 37,000. This harvest, combined with the Johnstone Strait commercial fishery, was calculated to slightly exceed the 20% allowable harvest of the estimated total run size hence no further

commercial fisheries were anticipated. In late November, however, test fishing indicated that the Fraser River escapement goal was expected to be surpassed and a surplus of enhanced chum was identified. In consistency with the clockwork rules, which define the allowable fishing time in the Fraser River, and the presence of an identified surplus of chum resulted in a decision to permit a commercial fishery in the river. This fishery occurred during a period of unusual cold weather and when the surplus of chum was leaving the commercial fishery area. As a result the opening only harvested 7,200 chum.

The pre-season expected stock size for the Mid Vancouver Island area was 713,000 chum. Most of all the expected surplus was anticipated to be harvested in the terminal area. The larger than anticipated total return resulted in a catch of Mid Vancouver Island chums in Johnstone Strait of approximately 106,000 pieces during the fishery on October 6-7. Management plans were developed to harvest the balance of the surplus to escapement needs terminally.

Harvesting of enhanced coho and chum salmon by gillnets only was initiated on October 7 (Table 8). Details regarding gear, days fished, and areas opened are provided in Appendix E. The Area 14 fishery continued as a gillnet only fishery each week until the week ending November 2. At that time the fishery was closed until escapement requirements were met.

The fishery re-opened on November 24 for a clean up fishery for both gillnet and seine gear. The seasonal total catch for the Mid Vancouver Island fishery was 526,600 with 40% of the catch harvested in the early part of the season, prior to November 2. The percent of the catch by gear for Area 14 was gillnets 46.8% and seines 53.2% with the seine component being exclusively harvested in the single clean up fishery. The majority of the Area 14 fisheries targetted on local stocks with the exception of the first opening which may have contained an elevated component of Fraser River stocks (potential problems in the sample process likely have led to the high Fraser indication).

(2) Indian Food Fisheries

Indian food fisheries are not restricted within the present clockwork harvest management plan. They are, however, included in the determination of the total allowable catch and overall harvest rate. Native catches for 1985 are summarized by statistical area and combined with data from 1960 to 1985 in Table 11. Catches for 1985 were slightly above average and totalled 50,000 chums. A noticeable decrease in catch was observed in the Fraser River. The total catch of 5,900 chum was well below the recent five year average of 14,800 (Schubert 1985).

(3) American Fisheries

The total American 7 and 7A catch for 1985 totalled 164,000 and was the highest since 1980 (Table 12). In the absence of stock identification

research, the Canadian component of American catches in Areas 7 and 7A, is currently calculated using a static percentage of the total catch. For 1985 and past years the percent of Canadian origin stock is 95% and 70% for the Point Roberts and San Juan Islands areas, respectively. Consequently, the American catch of Canadian origin chum is estimated at 138,000 for 1985. In recent years, American catches of Canadian chum have been low due to the limited abundance of Fraser fish and the absence of American chum fisheries.

SPAWNING ESCAPEMENTS

Previous reports have included spawning escapements for both summer and fall chums. Starting in 1985 summer run chum salmon are no longer assigned as part of the reported Study Area chum stocks. Escapement of summer run chum averaged less than 4% of the total escapement in previous years and less than 1% for 1985. Past years data have been adjusted accordingly, and the exclusion of summer run chum from the escapement total has resulted in only minor changes in the escapement totals previously reported (Table 13).

The 1985 Study Area chum escapement was the highest recorded since 1950. Enumeration of fall chum salmon is summarized by major stock sub-areas in Table 13 and detailed by stream in Appendix F. Two major stocks, those of the Fraser River and Mid Vancouver Island areas, totalled 54% of the total escapement. The majority of the other sub-areas received escapements approximately equal to or greater than 1984. Kingcome, Bond, Knight, Loughborough, Bute, and Toba inlets all received less escapement than 1984. The total Study Area escapement increased by 57% over 1984, with notable increases occurring in the Mid and Southern Vancouver Island, Howe Sound - Sunshine Coast, and the Fraser River areas. The Fraser River received a record high escapement of 901,000 chum. This spawning level was 200,000 greater than the stated escapement goal.

TOTAL STOCK AND PRODUCTION

(1) Study Area Total Stock

The estimated size of the total stock of fall Study Area chum, including catches from all fisheries and escapements to all streams, was 3.67 million for 1985 (Table 14). This estimated final stock size substantially exceeds the in-season stock size determination of 2.97 million chum and represents the largest stock size since 1972.

From this larger return a total harvest of 1.21 million chum produced an overall harvest rate of 33.0%. It should be noted that the majority of the catch was terminally harvested enhanced stock caught in the Mid Vancouver Island area which was not considered part of the clockwork calculations.

Table 15 outlines the total production of Study Area chum for 1955 to 1980 brood years. For those years, an average escapement of 1.10 million chum produced an average production of 1.81 million chum on an average return

to escapement of 1.88. The average three year old production for all years is 28.8%.

(2) Fraser River Total Stock

The estimated total Fraser River stock for 1985 was 1,505,000 chum. Table 16 outlines catch by area, escapement, total Fraser River stock and exploitation rates from 1967 to 1985. The total catch of Fraser origin chum in 1985 was 604,050 which resulted in a total exploitation rate of 40.1%. This exploitation rate is the highest since the inception of the clockwork plan in 1983. The largest catches of Fraser River chum occurred in Johnstone Strait, US Point Robert/San Juan and the Area 22 (Nitinat) fisheries.

(3) Mid Vancouver Island Total Stock

Mid Vancouver Island enhanced chum returns are comprised of returns to the Big Qualicum, Little Qualicum and Puntledge River facilities. Total enhanced returns for the area, including catch by area, escapement, total return and exploitation from 1978 to 1985 are detailed in Table 17.

The total enhanced return to the area was 872,700 chum for 1985. Both the 1985 catch and the total return of enhanced Mid Vancouver Island stock substantially exceeded previous levels. The catch totalled 604,500 which resulted in a 69.3% harvest rate for enhanced chum. Over 80% of the catch occurred terminally in Area 14, with the balance harvested in Johnstone Strait.

REVIEW OF CLOCKWORK MANAGEMENT PLAN

In reviewing the clockwork management plan and the final 1985 fishing results, the in-season assessment fell short of determining the actual stock size by approximately 700,000 chum. The in-season stock size estimate of 2.97 million chums meant that a maximum 20% harvest rate was required when, in fact, a 30% harvest rate should have been applied to the larger final estimate of 3.67 million. Theoretically, the combined Johnstone Strait, Fraser River, and U.S. Areas 7 and 7A Canadian chum catch should have been 1.10 million chum when the actual total catch was only 756,000.

The primary in-season stock size assessment method used in 1985 was the analysis of test fishing results in the upper Johnstone Strait area. It, however, assesses only those chum stocks migrating through the northern approach via Johnstone Strait. Stock identification studies conducted in the Juan de Fuca Strait and on the southern west coast of Vancouver Island suggest a strong southern diversion of Fraser River and southern Strait of Georgia chum for 1985 and may explain the apparent assessment discrepancy (Beacham et al. 1987).

ACKNOWLEDGMENTS

We are indebted to the South Coast Advisory Committee for their dedication to the co-management process. The South Coast and Fraser River Division Area Managers, Dennis Brock and Fred Fraser, along with their District Supervisors, Biologists and staff are thanked for their cooperation. R. Harrison reviewed the report. Alf Stefanson, Alvin Sewid and Gerry Buxton provided supervision of field management programs. Mr. Jim Lettic conducted the chum electrophoretic analysis. D. Bailey provided production data on Mid Vancouver Island enhanced stocks. We thank all fishermen and processors staff involved in our test fishing program. Mrs. Shelley Doering typed and revised each report draft.

LITERATURE CITED

Anderson A. D., and T. D. Beacham. 1983. The migration and exploitation of chum salmon stocks of the Johnstone Strait - Fraser River Study Area, 1962-1970. Can. Tech. Rep. Fish. Aquat. Sci. 116: 125 p.

Beacham, T. D., R. E. Withler, A. P. Gould, and M. K. Farwell. 1985. Biochemical genetic stock compositions of chum fisheries in southern British Columbia, 1981-1983. Can. Tech. Rep. Fish. Aquat. Sci. 1356: 23 p.

Beacham, T. D., A.P. Gould, R.E. Withler, C.B. Murray and C.W. Barner. 1987. A biochemical genetic survey and stock identification of chum salmon (Oncorhyncus keta) in British Columbia. Can. J. Fish. Aquat. Sci. (in press).

Gould, A. P., and L. Hop Wo. 1986. Johnstone Strait chum test fishing data for 1965-1984. Can. Data Rep. Fish. Aquat. Sci. No. 522: 108 p.

Gould, A. P., and L. Hop Wo. 1987. A review of the 1983 and 1984 chum salmon season in the Johnstone Strait - Fraser River Study Area. Can. J. Fish. Aquat. Sci. (in press).

Hillborn, R., and W. Luedke. 1987. Rationalizing the irrational: A view of user group participation in chum salmon management. Can. J. Fish. Aquat. Sci. (in press).

Schubert, N. D. 1985. The Indian food fishery of the Fraser River: 1984 summary. Can. Data Rep. Fish. Aquat. Sci. 512: 64p.

Table 1. The pre-season projected Study Area chum stock size by origin for 1985.

Stocks	Projected stock size		
	Fraser River	Study Area less Fraser River	Total
Wild	501,800	993,400	1,495,200
Enhanced	265,000	607,900	872,900
American	--	--	100,000
Total	766,800	1,601,300	2,468,100

Table 2. Pre-season projected stock size, spawning requirements and harvestable surpluses of Study Area chum, 1985.

	Wild Stocks		Enhanced Stocks	
	Fraser	Non-Fraser	Fraser	Non-Fraser
Returns:				
Age 3	107,300	320,200	48,140	231,200
Age 4	372,000	614,800	166,750	285,700
Age 5	22,500	58,400	10,110	21,000
Total	501,800	993,400[a]	265,000	607,900
Spawning requirements:	700,000	1,800,000	110,000	205,000
Balance:	0	0	155,000[b]	402,900
Harvestable surplus:	0	0	0	402,900

[a]American returns through Johnstone Strait not included.

[b]Fraser River hatchery surplus to be utilized on the wild spawning grounds.

Table 3. Review of Study Area Expectations: Predictions versus actual chum returns, 1969 - 1985.

Year	Predicted return	Actual return	Diff.	Diff. compared to actual
1969	1,597,000	1,719,100	122,100	7.1%
1970	1,876,000	2,189,200	313,200	14.3%
1971	1,573,300	827,500	745,800	90.1%
1972	1,515,000	3,979,100	2,464,100	61.9%
1973	3,900,000	4,596,100	696,100	15.1%
1974	1,554,000	1,808,800	254,800	14.1%
1975	1,350,000	1,247,600	102,400	8.2%
1976	3,600,000	2,110,700	1,489,300	70.6%
1977	2,577,000	1,640,700	936,300	57.1%
1978	2,395,000	3,059,400	664,400	21.7%
1979	1,205,000	873,500	331,500	38.0%
1980	1,617,300	2,242,100	624,800	27.9%
1981	1,809,500	1,463,900	345,600	23.6%
1982	2,860,000	2,927,400	67,400	2.3%
1983	1,864,600	1,475,100	389,500	26.4%
1984	1,701,800	1,838,200	136,400	7.4%
1985	2,368,100	3,670,000	1,301,900	35.5%
Total avg.	2,080,200	2,215,800	646,200	30.7%
1980-1985	2,036,900	2,269,500	477,600	20.5%

Table 4. The 1985 clockwork schedule for stock assessment.

Week	Assessment Method (Release Date)	Point Estimate	Averaged Estimate	Clockwork Harvest Rate	Allowable catch (TAC)
9/1	Pre season forecast (Aug 31)	2.46		10%	246,000
9/2	No in-season estimate				
9/3	Commercial catch correlation (Sept 19)	2.62	2.62	20%	524,000
9/4	Interim first test fish update correlation (avail. Sept 28, not released)	2.71	NOT USED		
10/1	First test fishing correlation (Oct 4)	2.92	2.92	20%	584,000
10/2	Second test fish correlation (Oct 11)	3.05	2.98	20%	597,000
10/3	Third test fish correlation (Oct 18)	2.93	2.97	20%	594,000
	Final In-season Estimate		2.97	20%	594,000

NOTE: The week ending 10/2 test fish results were not available until Sunday Oct. 13 and an interm number was present Friday Oct. 11. In WE 10/3 the calculation of run size was conducted on Thurs. Oct 17 on only 4 days of test fish data.

Background

Inseason point estimates are averaged for the official clockwork estimate. Equal weight is given to each estimate.

Table 5. Weekly test fishing catches for Johnstone Strait, 1985.

Week ending	Total weekly catch	# of sets per week	Average catch per set
Upper Johnstone Strait (Area 12)		Vessel 1	
Sept. 7	127	18	7.1
Sept. 14	528	18	29.3
Sept. 21	291	18	16.2
Sept. 28	10,301	30	343.4
Oct. 5	15,532	30	517.7
Oct. 12	10,098	23	439.0
Oct. 19	12,157	30	405.2
Oct. 26	5,014	26	192.8
Nov. 2	986	14	70.4
Upper Johnstone Strait (Area 12)		Vessel 2	
Sept. 28	6,670	24	277.9
Oct. 5	18,605	30	620.2
Oct. 14	12,452	22	566.0
Oct. 19	10,958	27	405.9
Oct. 26	18,507	26	711.8
Nov. 2	1,777	8	222.1
Lower Johnstone Strait (Area 13)			
Sept. 28	5,990	14	427.9
Oct. 5	16,115	15	1,074.3
Oct. 14	18,425	15	1,228.3
Oct. 18	14,650	12	1,220.8
Oct. 26	22,825	14	1,630.4
Nov. 2	32,370	14	2,312.1
Nov. 9	14,100	13	1,084.6

Table 6. Chum stock composition, from upper Johnstone Strait electrophoretic sampling, 1985 post-season analysis.

Week ending	No. of samples	Stock component[a]		
		% FR	%CNF	%US
Sep. 7	109	69.0 (16.2)	25.1 (14.6)	5.9 (5.9)
Sep. 14	146	73.9 (16.6)	21.4 (14.2)	4.7 (5.6)
Sep. 21	153	42.6 (12.7)	51.9 (12.5)	5.5 (5.4)
Sep. 28	153	38.8 (13.9)	56.2 (13.9)	5.1 (4.3)
Oct. 5	152	33.7 (18.2)	52.7 (17.4)	13.6 (7.6)
Oct. 12	148	28.7 (16.6)	57.4 (18.1)	14.0 (8.0)
Oct. 19	151	23.7 (13.4)	67.9 (12.9)	8.4 (6.3)
Oct. 26	150	3.5 (5.8)	85.3 (7.3)	11.3 (7.3)
Nov. 2	154	25.8 (14.0)	67.5 (13.7)	6.7 (6.1)

[a]Stock components: FR = Fraser River
CNF = Canada non-Fraser River
US = Washington State
( ) = Standard deviation

Table 7. Chum stock composition in the Mid Vancouver Island Area as sampled from commercial and test fishing, 1985.

Fishery week ending	Decision date	Fishery date	Area	Inside or outside	Sample date	Sample size	Gear	Test fishery sample			Commercial sample		
								%FR	%CNF	%US	%FR	%CNF	%US
10/2	Oct. 4	Oct. 7-9	14- 5	Inside	Oct. 8	150	GN				35.3[a]	64.5	0.1
10/3	Oct. 11	Oct. 15-17	14-10	Inside	Oct. 10	95	GN	34.6	41.3	24.4			
			14- 9	Inside	Oct. 12	83	SN	1.7	88.5	9.8			
			14- 5	Inside	Oct. 15	39	GN				Insuff.	Sample	Size
			14- 4	Inside	Oct. 14	104	GN				1.1	93.1	5.9
			14-11	Inside	Oct. 16	150	GN				0.3	99.2	0.0
			14- 5	Outside	Oct. 15	22	SN	Insuff.	Sample	Size			
			14- 9	Inside	Oct. 17	128	SN	0.9	94.3	5.0			
			14-10	Inside	Oct. 18	47	GN	44.3	55.6	1.0			
10/4	Oct. 18	Oct. 21-24	14-4&5	Inside	Oct. 22	145	GN				5.5	84.6	9.6
			14-11	Inside	Oct. 22	146	GN				15.1	83.5	1.7
			14-10	Inside	Oct. 23	150	SN	2.6	91.6	5.7			
			14- 5	Outside	Oct. 25	147	SN	0.3	82.6	17.1			
			14- 9	Inside	Oct. 25	100	GN	14.9	72.0	13.4			
10/5	Oct. 25	Oct.29-31	14-4&5	Inside	Oct. 29	149	GN				1.8	98.0	0.1
			14-9	Inside	Oct. 30	149	SN	4.8	87.4	7.9			
			14-10	Inside	Nov. 2	150	SN	8.8	84.9	6.4			

CNF = Canadian Non Fraser

US = United States (Washington State)

[a]Problems with the electrophoretic analysis procedure limits the validity of this sample.

Table 8. Commercial catch of chum salmon by statistical area for all gear types, 1985.

Week ending period	Statistical area						Total
	11	12	13	14	15-19	29	
Sept. 7	1,439	26,891	3,438	0	14	893(a)	32,675
14	951	28,494	7,645	39	7	1,542	38,678
21	151	33,947	8,451	152	8	598	43,307
28	150	171	26	50	1	7	405
Oct. 5	131	0	0	128	62	203	524
12	0	237,136	161,599	14,476	0	37,363	450,574
19	1	4,177	0	25,571	0	1,250	30,999
26	0	0	0	86,585	0	1,621	88,206
Nov. 2	0	1,446	70	81,625	161	1,310	84,612
November	0	0	0	317,964	54	7,210	325,228
December	0	0	0	0	0	546	546
Total	2,823	332,262	181,229	526,590	307	52,543	1,095,754

Data source: British Columbia Catch Statistics.
Note: Catches in Areas 12, 13 and 29 during non-commercial openings represent test fish catch.

(a) Include all catches prior to 1st week in September.

Table 9. Comparison of in-season and post-season chum catch estimates, for areas 12 to 14, 1985.

	Gillnet			Seine		
Area	In-season	Post-season	% Diff. from In-season	In-Season	Post-Season	% Diff. from In-Season
12	41,398	46,183	-11.6%	300,245	285,205	5.0%
13	13,377	11,492	14.1%	151,370	169,230	-11.8%
14	276,460	246,455	10.9%	280,465	275,017	1.9%
Total	331,235	304,130	8.2%	732,080	734,361	-0.3%

Note: In-season data include hails from Fisheries Officers and preliminary sales slips data.

Post-season data from British Columbia Catch Statistics.

Table 10. Commercial catch of chum salmon by statistical area and gear with percentages for 1985.

	Areas													
Gear	11	%	12	%	13	%	14	%	15-18	%	29	%	Total	%
Gillnet	0	0.0	46,183	13.9	11,492	6.3	246,455	46.8	161	52.4	51,781	100.0	356,072	32.5
Seine	0	0.0	285,205	85.8	169,230	93.4	279,926	53.2	0	0.0	0	0.0	734,361	67.1
Troll	2,823	100.0	874	0.3	507	0.3	209	0.0	146	47.6	19	0.0	4,578	0.4
Total	2,823		332,262		181,229		526,590		307		51,800		1,095,011	

Data Source: British Columbia Catch Statistics.

Table 11. Indian food fishery catches of chum salmon by statistical area, 1960-1985.

Years	Statistical area								Total		Combined
	12	13	14	15	16	17	18	19	JS-Gulf	29	total
1960	4600	2583	245	3500	4500	750	2231	N/A	18409	9970	28379
1961	4600	2431	150	2500	300	700	1978	N/A	12659	9647	22306
1962	4391	1412	45	2000	400	860	3197	N/A	12305	11300	23605
1963	5122	1359	506	1500	650	280	3317	N/A	12734	10741	23475
1964	6054	1756	21	1200	400	580	1773	N/A	11784	12210	23994
1965	3432	748	124	500	100	400	1960	0	7264	7390	14654
1966	4314	N/A	157	950	400	1480	2772	0	10072	12181	22253
1967	5201	N/A	215	200	600	850	4000	0	11066	8800	19866
1968	4046	1708	360	2356	349	905	5395	100	15219	11102	26321
1969	3367	3346	440	2162	300	1745	3400	50	14810	4300	19110
1970	3632	4725	972	1652	200	3000	2204	50	16435	5603	22038
1971	4406	3677	850	1952	1317	2275	1375	0	15852	4022	19874
1972	5487	4690	265	1320	243	4675	3000	100	19780	6301	26081
1973	2979	3543	5530	1400	637	4800	2200	0	21089	10742	31831
1974	4814	6940	14000	2000	300	6000	5000	20	39074	15102	54176
1975	6800	5656	2800	3000	400	1700	2400	0	22756	7087	29843
1976	3400	6679	9273	2200	55	1800	3500	0	26907	13603	40510
1977	8030	9419	N/A	5000	2036	2550	3350	22	30407	9342	39748
1978	3750	5572	N/A	N/A	1263	4805	3000	633	19023	9509	28532
1979	6900	7836	950	N/A	1639	4470	1500	950	24245	8202	32447
1980	N/A	N/A	4576	3000	1500	2750	1000	1055	13881	12333	26214
1981	4700	6779	13044	5500	1500	2200	2000	N/A	35712	11170	46893
1982	8456	12733	1212	6000	664	3588	2000	N/A	34653	19233	53886
1983	7608	77	3154	4200	1180	9550	5000	N/A	30769	12637	43406
1984	11906	9000	2000	3000	1634	8000	4000	N/A	39540	18637	58177
1985	3692	9070	10920	5500	0	5800	9000	N/A	43982	5859	49841
Averages:											
1960-1969:	4513	1918	226	1687	800	855	3002	30	12632	9764	22396
1970-1979:	5020	5874	4330	2316	809	3608	2753	178	23557	8951	32508
1980-1985:	7272	7532	5818	4533	1080	5315	3833	1055	33091	13312	46403
1960-1985:	5267	4858	2992	2668	868	2943	3098	186	21555	10270	31825

NOTE: 1985 Data are preliminary.

N/A = Not available.

Table 12. Annual American chum catches and the respective Canadian catch component in American Area 7 & 7A fisheries, 1960 to 1985.

	Total catch			Canadian catch		
Year	Area 7A Pt. Roberts	Area 7 San Juan Is.	Total	Area 7A[a] Pt. Roberts	Area 7[b] San Juan Is.	Total
1960	19,683	6,712	26,395	18,699	4,698	23,397
1961	11,203	10,164	21,367	10,643	7,115	17,758
1962	5,531	6,695	12,226	5,254	4,687	9,941
1963	7,269	5,798	13,067	6,906	4,059	10,964
1964	8,665	6,304	14,969	8,232	4,413	12,645
1965	3,161	4,897	8,058	3,003	3,428	6,431
1966	9,010	3,484	12,494	8,560	2,439	10,998
1967	8,421	2,868	11,289	8,000	2,008	10,008
1968	72,197	21,980	94,177	68,587	15,386	83,973
1969	32,837	16,709	49,546	31,195	11,696	42,891
1970	55,118	20,340	75,458	52,362	14,238	66,600
1971	13,895	13,053	26,948	13,200	9,137	22,337
1972	177,768	163,584	341,352	168,880	114,509	283,388
1973	138,205	135,740	273,945	131,295	95,018	226,313
1974	95,707	105,420	201,127	90,922	73,794	164,716
1975	50,757	41,963	92,970	48,219	29,374	77,593
1976	105,885	171,331	277,216	100,591	119,932	220,522
1977	23,162	28,136	51,298	22,004	19,695	41,699
1978	165,327	221,980	387,307	157,061	155,386	312,447
1979	1,978	2,743	4,721	1,879	1,920	3,799
1980	3,185	201,090	204,275	3,026	140,763	143,789
1981	1,997	7,163	9,160	1,897	1,920	3,799
1982	34,786	41,275	76,061	33,047	28,893	61,939
1983	386	2,238	2,624	367	1,567	1,933
1984	500	1,058	1,558	475	741	1,216
1985	93,317	71,000	164,317	88,651	49,700	138,351

NOTE: 1985 catch data from University of Washington, Washington State Department of Fisheries computer data base.

[a]Based on 95% of Area 7A catch.

[b]Based on 70% of Area 7 catch.

Table 13. Study Area chum salmon spawning escapements in thousands of fish by Area, 1950-1985.

Stock group	Capacity	1985	1984	1983	1982	1981	1980	70-79	60-69	50-59
Upper Vancouver Is.	32.9	0.9	0.4	0.3	0.0	0.0	0.0	1.4	9.0	25.1
Kingcome Inlet	113.5	5.7	6.4	8.0	14.5	11.6	14.1	39.6	22.1	69.2
Bond to Knight Inlet	220.0	43.0	50.3	32.4	69.6	9.7	34.6	66.2	76.6	131.6
Johnstone Strait	137.0	78.4	45.8	9.5	55.1	16.6	17.5	24.2	30.1	78.1
Loughborough to Bute	150.0	117.9	125.1	103.1	234.3	149.3	159.8	94.3	33.8	55.0
Mid Vancouver Is.	299.0	370.4	221.8	281.8	269.7	230.8	203.1	233.7	153.4	163.6
Toba Inlet	136.0	11.6	18.9	17.7	15.0	17.7	6.3	19.0	23.2	73.9
Jervis Inlet	149.8	174.6	150.1	73.2	48.6	92.3	98.5	74.3	63.9	72.1
Lower Vancouver Island	147.4	95.7	86.7	72.9	56.7	48.9	60.6	53.8	32.6	78.4
Southern Vancouver Is.	238.5	254.5	138.0	115.5	172.6	130.7	157.0	90.5	77.7	116.2
Howe Sound to Sunshine	350.0	373.6	156.2	86.5	133.8	130.2	231.7	131.1	42.5	69.3
Burrard Inlet	50.0	30.6	30.0	27.1	24.4	18.9	15.5	17.0	6.0	17.2
Fraser River	700.0	901.2	533.0	365.0	320.3	435.3	312.1	336.3	319.7	115.7
Boundary Bay	5.0	0.3	0.8	0.4	0.2	0.1	0.2	0.2	0.0	0.4
Grand total	2729.1[a]	2459.0	1564.4	1193.0	1415.0	1292.1	1311.0	1181.6	890.5	1065.8

[a] Includes Mid Vancouver Island enhanced escapement requirement.

Table 14. Catch, escapement, total stock, and harvest rates for Study Area chum stocks, 1960-1985.

Year	Canadian catch[a]	American catch[b]	Escapement	Total stock	Total harvest rate
1960	731600	23397	748800	1503800	50.2%
1961	347400	17758	656100	1021300	35.8%
1962	265000	9941	714200	989100	27.8%
1963	327800	10964	700300	1039100	32.6%
1964	164400	12645	901000	1078000	16.4%
1965	40400	6431	404400	451200	10.4%
1966	64700	10998	1001800	1077500	7.0%
1967	179000	10008	711600	900600	21.0%
1968	772100	83973	1898400	2754500	31.1%
1969	588000	42891	1088200	1719100	36.7%
1970	956500	66600	1166100	2189200	46.7%
1971	127000	22337	678200	827500	18.0%
1972	1867100	283388	1828600	3979100	54.0%
1973	2789400	226313	1580400	4596100	65.6%
1974	400700	164716	1243400	1808800	31.3%
1975	497700	77593	672300	1247600	46.1%
1976	950300	220522	939900	2110700	55.5%
1977	165900	41699	1433100	1640700	12.7%
1978	1332000	312447	1415000	3059400	53.8%
1979	95300	3799	774400	873500	11.3%
1980	787300	143789	1311000	2242100	41.5%
1981	164800	6911	1292100	1463800	11.7%
1982	1450500	61939	1415000	2927400	51.7%
1983	279800	1933	1193300	1475000	19.1%
1984	272600	1216	1564400	1838200	14.9%
1985	1072600	138351	2459000	3670000	33.0%
Averages:					
1960-1969	348040	22901	882480	1253420	26.9%
1970-1979	918190	141941	1173140	2233260	39.5%
1980-1985	671267	59023	1539133	2269417	28.7%
1960-1985	641919	77022	1145808	1864742	32.2%

[a]Canadian catch from Areas 11 to 19 & 29 of commercial and Indian Food Fisheries, U.S. Component of Johnstone Strait catch excluded.

[b]American catch of Canadian chums from Areas 7 & 7A.

Table 15. Production Summary of Study Area Chum Salmon Since 1955. Includes Catch and Escapement Hatchery Chum at MVI.

Year	Escapement	Catch	Total Return	Return from brood at Age 3	Age 4	Age 5	Brood Return	Percent return at Age 3	Age4	Age 5	RATIO R/E
1955	612700	578327	1191027	1071446	1352385	13985	2437816	44.0	55.5	0.6	3.98
1956	496171	648206	1144377	695357	905579	19608	1620544	42.9	55.9	1.2	3.27
1957	1025550	509204	1534754	584220	888789	16419	1489428	39.2	59.7	1.1	1.45
1958	1143035	1321192	2464227	112847	187630	5299	305776	36.9	61.4	1.7	0.27
1959	899430	1195018	2094448	785137	671451	7547	1464135	53.6	45.9	0.5	1.63
1960	748825	754960	1503785	362326	823879	10198	1196404	30.3	68.9	0.9	1.60
1961	656095	365149	1021244	246668	279462	9697	535827	46.0	52.2	1.8	0.82
1962	714157	274930	989087	161594	874881	11707	1048182	15.4	83.5	1.1	1.47
1963	700295	338781	1039076	192862	323297	13497	529656	36.4	61.0	2.5	0.76
1964	901010	177084	1078094	564644	2277913	63090	2905648	19.4	78.4	2.2	3.22
1965	404435	46820	451255	462744	866417	20579	1349740	34.3	64.2	1.5	3.34
1966	1001750	75690	1077440	789059	1982115	89541	2860715	27.6	69.3	3.1	2.86
1967	711565	188984	900549	186740	393086	73216	653042	28.6	60.2	11.2	0.92
1968	1898400	856030	2754430	345088	3621801	762031	4728920	7.3	76.6	16.1	2.49
1969	1088200	630882	1719082	284110	3712717	473905	4470731	6.4	83.0	10.6	4.11
1970	1166136	1023079	2189215	121337	960471	42170	1123978	10.8	85.5	3.8	0.96
1971	678177	149372	827549	368994	483713	29550	882258	41.8	54.8	3.3	1.30
1972	1828589	2150537	3979126	721140	1768806	36096	2526042	28.5	70.0	1.4	1.38
1973	1580356	3015728	4596084	312391	1219051	62719	1594160	19.6	76.5	3.9	1.01
1974	1243416	565380	1808796	383927	2560753	146744	3091424	12.4	82.8	4.7	2.49
1975	672320	575327	1247647	437500	409661	17937	865098	50.6	47.4	2.1	1.29
1976	939918	1170829	2110747	317946	1591876	97639	2007461	15.8	79.3	4.9	2.14
1977	1433100	207614	1640714	634508	1163031	131734	1929273	32.9	60.3	6.8	1.35
1978	1414987	1644455	3059442	202012	2189713	390889	2782613	7.3	78.7	14.0	1.97
1979	774352	99126	873478	605977	824554	82719	1513250	40.0	54.5	5.5	1.95
1980	1310988	931090	2242078	258134	845573	80739	1184446	21.8	71.4	6.8	0.90
1981	1292138	171715	1463853	904395	2220329						
1982	1415019	1512404	2927423	1368897							
1983	1193278	281774	1475052								
1984	1564357	273845	1838202								
1985	2458965	1211000	3669965								
AVERAGE	1095733	740146	1835879	448633	1311072	104202	1811406	28.8	66.8	4.4	1.88
EVEN YRS	1185784	891981	2077765	457451	1583922	135058	2106319	21.3	74.0	4.8	1.92
ODD YRS	1011310	597801	1609111	505549	1057710	73346	1516493	36.4	59.6	4.0	1.84

Note: Escapement from all Study Area streams, revised includes New West streams.
Catch includes IFF, US catch of Canadian, test, commercial less JS catch of US.
Total return from catch + escapement.

Table 16. Catch, Escapement, Total Stock and Exploitation of Fraser River Chum.

Return Year	Areas 12 & 13*	%	Pt. Roberts & San Juan	%	Juan de Fuca (US)	%	Area 29 IFF/Test	%	Area 29	%	Total Catch	Esc.	Total Stock	Exploit -ation
1967	36430	35.3	11290	11.0			8800	8.5	46540	45.2	103060	213870	316930	32.5%
1968	298250	49.2	94180	15.5			11100	1.8	202370	33.4	605900	822200	1428100	42.4%
1969	183800	56.3	49610	15.2			4300	1.3	88930	27.2	326640	390100	716740	45.6%
1970	209070	44.5	75460	16.1	440	0.1	5600	1.2	178920	38.1	469490	287250	756740	62.0%
1971	40210	43.2	26950	28.9	240	0.3	4020	4.3	21690	23.3	93110	290150	383260	24.3%
1972	444710	42.4	341350	32.5	1040	0.1	6300	0.6	256370	24.4	049770	423290	1473060	71.3%
1973	590250	55.4	273950	25.7	680	0.1	10740	1.0	190540	17.9	066160	267110	1333270	80.0%
1974	101670	24.7	201130	48.8	1280	0.3	15100	3.7	93160	22.6	412340	350390	762730	54.1%
1975	144530	45.4	92720	29.1	300	0.1	7090	2.2	73470	23.1	318110	191450	509560	62.4%
1976	343630	42.4	277220	34.2	1180	0.1	13600	1.7	174110	21.5	809740	340470	1150210	70.4%
1977	42070	35.3	51300	43.0	2070	1.7	9340	7.8	14390	12.1	119170	599370	718540	16.6%
1978	485440	47.6	387310	38.0	12970	1.3	9510	0.9	124750	12.2	019980	359070	1379050	74.0%
1979	20330	49.0	4720	11.4	480	1.2	8200	19.8	7770	18.7	41500	255630	297130	14.0%
1980	243150	35.7	344280	50.6	5490	0.8	12400	1.8	75530	11.1	680850	312140	992990	68.6%
1981	26520	46.7	9160	16.1	1060	1.9	11200	9.7	8790	15.5	56730	435310	492040	11.5%
1982	247340	60.4	76060	18.6	1680	0.4	21230	5.2	63260	15.4	409570	320290	729860	56.1%
1983	83160	70.3	2620	2.2	4940	4.2	15010	2.7	12560	10.6	118290	364990	483280	24.5%
1984	18910	28.5	1560	2.4	4850	7.3	25890	9.0	15090	22.8	66300	533010	599310	11.1%
1985	220880	36.6	160940	26.6	15360	2.5	31410	5.2	52540	8.7	604050	*901200	1505250	40.1%

*Note Additional catches from the Georgia Strait area have been added to the J.S. catch in 1982 (11440), 1983 (26970), 1984 (1080) and 1985 (15680).

** West Coast catches for 1985 of 122920 have been included in the total catch.

Table 17. Catch, Escapement, Total Stock and Exploitation of Mid Vancouver Island Enhanced Chum 1978-1985.

Year	Catch Johnstone Strait	%	Area 14	%	Total Catch	Escapement	Total Return	Exploitation Rate
1978	184,200	66.6%	92,300	33.4%	276,500	124,600	401,100	68.9%
1979	0	0.0%	5,800	100.0%	5,800	127,000	132,800	4.4%
1980	24,700	25.3%	73,100	74.7%	97,800	93,200	191,000	51.2%
1981	0	0.0%	46,200	100.0%	46,200	82,000	128,200	36.0%
1982[1]	79,500	36.4%	139,000	63.6%	218,500	135,500	354,000	61.7%
1983	0	0.0%	108,700	100.0%	108,700	186,800	295,500	36.8%
1984	0	0.0%	173,000	100.0%	173,000	148,800	321,800	53.8%
1985	115,900	19.2%	488,600	80.8%	604,500	268,200	872,700	69.3%
Averages:								

[1] The first puntledge and Little Qualicum River enhancement production returns occurred in 1982. Prior to 1982 all enhanced returns were from Big Qualicum River facility only.

Data Source: D. Bailey

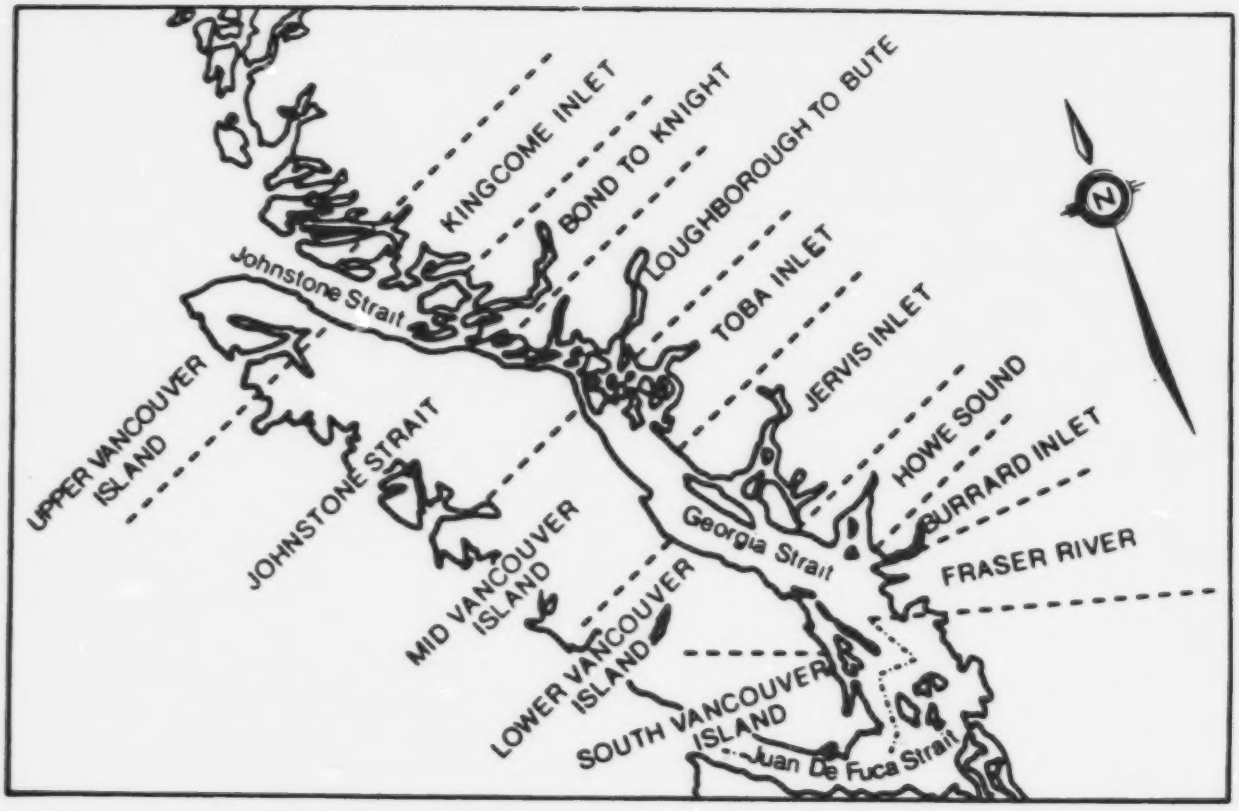

Figure 1. Location map of the Johnstone Strait - Fraser River Chum Salmon Study Area.

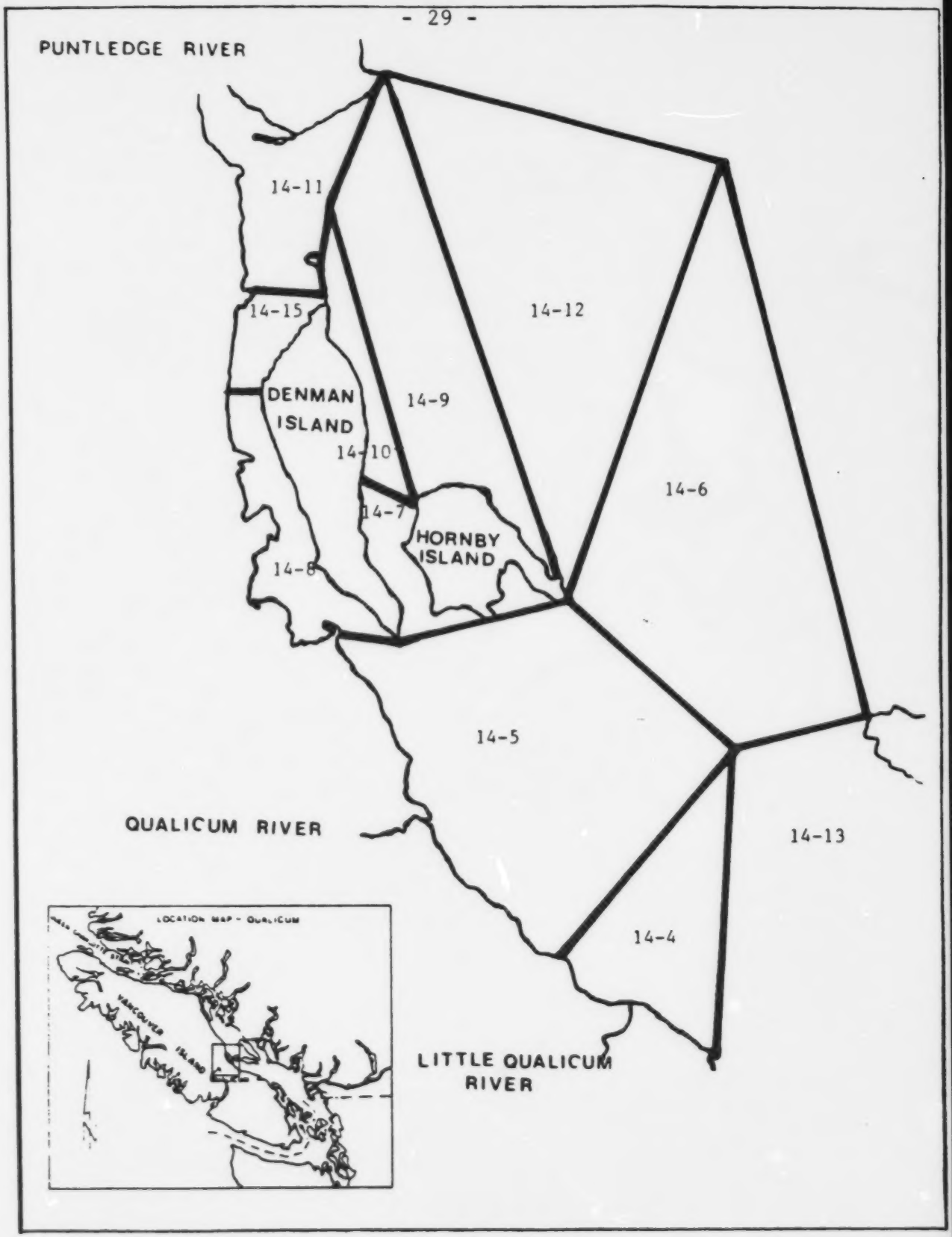

Figure 2. Sub-area statistical map of Mid Vancouver Island area.

Appendix A. Catch summary of upper Johnstone Strait chum test fishing, 1985 (Vessel #1)

Date	Chum catch	# of sets	Average catch	Date	Chum catch	# of sets	Average catch
02-Sep-85				09-Oct-85			
03-Sep-85				10-Oct-85	58	5	11.6
04-Sep-85	61	6	10.2	11-Oct-85	7325	6	1220.8
05-Sep-85	35	6	5.8	12-Oct-85	2071	6	345.2
06-Sep-85	31	6	5.2	13-Oct-85	644	6	107.3
Total 9/1	127	18	7.1	Total 10/2	10098	23	439.0
09-Sep-85				14-Oct-85	1511	6	251.8
10-Sep-85				15-Oct-85	1783	6	297.2
11-Sep-85	39	6	6.5	16-Oct-85	4502	6	750.3
12-Sep-85	124	6	20.7	17-Oct-85	3830	6	638.3
13-Sep-85	365	6	60.8	18-Oct-85	531	6	88.5
Total 9/2	528	18	29.3	Total 10/3	12157	30	405.2
16-Sep-85				21-Oct-85	40	2	20.0
17-Sep-85				22-Oct-85	732	6	122.0
18-Sep-85	89	6	14.8	23-Oct-85	2403	6	400.5
19-Sep-85	131	6	21.8	24-Oct-85	1488	6	248.0
20-Sep-85	71	6	11.8	25-Oct-85	351	6	58.5
Total 9/3	291	18	16.2	Total 10/4	5014	26	192.8
23-Sep-85	259	6	43.2	28-Oct-85	136	6	22.7
24-Sep-85	3216	6	536.0	29-Oct-85	506	2	253.0
25-Sep-85	674	6	112.3	30-Oct-85	344	6	57.3
26-Sep-85	4136	6	689.3	31-Oct-85			
27-Sep-85	2016	6	336.0	01-Nov-85			
Total 9/4	10301	30	343.4	Total 10/5	986	14	70.4
30-Sep-85	6652	6	1108.7	04-Nov-85			
01-Oct-85	4241	6	706.8	05-Nov-85			
02-Oct-85	2497	6	416.2	06-Nov-85			
03-Oct-85	1273	6	212.2	07-Nov-85			
04-Oct-85	869	6	144.8	08-Nov-85			
Total 10/1	15532	30	517.7	TOTAL 11/1	0	0	

Appendix A. Summary of upper Johnstone Strait seine set locations, 1985 (Vessel #1)

Set location	Loc. Code	# of sets	% of sets
Total # of sets =		132	100.0%
Big Bay	1	10	7.6%
The Bluff	2	8	6.1%
Blow Hole	3	8	6.1%
Blue Line	4	3	2.3%
Bold Point	5	16	12.1%
China Town	6	5	3.8%
Cracroft	7	9	6.8%
Double Bay	8	17	12.9%
Kelp Point	9	9	6.8%
Merry Go Round	10	8	6.1%
Parsons Bay	11	8	6.1%
Siwash Rock	12	5	3.8%
The Bank	13	11	8.3%
White Rock	14	10	7.6%
White Beach	15	0	0.0%
Blinkhorn	16	4	3.0%
Return Point	17	0	0.0%
Freshwater Bay	18	0	0.0%
Izumi Rock	19	0	0.0%
Bauza Cove	20	1	0.8%
Fine Beach (RB)	21	0	0.0%
Beaver Cove	22	0	0.0%
Nimpkish R.	23	0	0.0%
Blackrish Sound	24	0	0.0%
Mid-Summer Is.	25	0	0.0%
Broken Islands	26	0	0.0%
Beautiful Bch. (AR)	27	0	0.0%
No location	99	0	0.0%

Appendix A. Daily data, upper Johnstone Strait test fishing, 1985 (Vessel #1)

Date	Set #	Loc. Code	Key Code	Set Time Start	Set Time Finish	Catch Chum	Coho	Chin	Pink	Sock
04-Sep-85	1	8	2	900	920	1	2	0	20	0
04-Sep-85	2	12	2	935	955	16	15	1	150	6
04-Sep-85	3	5	2	935	955	6	1	0	2	0
04-Sep-85	4	3	2	1200	1220	20	40	3	350	10
04-Sep-85	5	1	2	1300	1320	6	5	0	8	1
04-Sep-85	6	16	2	1415	1440	12	0	0	0	0
05-Sep-85	1	11	2	810	830	3	2	0	3	0
05-Sep-85	2	13	2	900	923	14	50	0	75	10
05-Sep-85	3	4	2	945	1005	4	30	1	70	15
05-Sep-85	4	8	2	1030	1050	1	35	0	65	15
05-Sep-85	5	3	2	1230	1250	6	50	0	200	0
05-Sep-85	6	1	2	1310	1330	7	8	0	50	0
06-Sep-85	1	11	2	745	805	14	5	0	25	0
06-Sep-85	2	6	2	840	900	1	0	0	2	0
06-Sep-85	3	4	1	920	940	5	7	0	40	0
06-Sep-85	4	5	2	1005	1025	8	35	0	300	30
06-Sep-85	5	8	2	1055	1115	0	2	0	50	0
06-Sep-85	6	1	2	1140	1200	3	1	0	1	1
11-Sep-85	1	2	2	903	923	0	2	1	24	0
11-Sep-85	2	11	1	957	1017	11	5	0	6	0
11-Sep-85	3	10	1	1115	1135	13	2	0	2	0
11-Sep-85	4	14	2	1220	1240	1	0	0	12	0
11-Sep-85	5	5	2	1315	1335	2	0	0	8	0
11-Sep-85	6	9	0	1400	1425	0	0	0	0	0
11-Sep-85	7	16	1	1500	1515	12	1	0	2	3
12-Sep-85	1	3	2	815	835	16	1	0	14	1
12-Sep-85	2	2	2	925	945	19	19	0	122	3
12-Sep-85	3	7	1	1000	1020	8	10	0	50	0
12-Sep-85	4	13	2	1100	1120	32	20	0	81	1
12-Sep-85	5	11	2	1200	1220	40	22	4	38	0
12-Sep-85	6	5	2	1300	1320	9	5	0	3	0
13-Sep-85	1	20	2	655	715	0	0	0	4	0
13-Sep-85	2	3	2	815	835	0	0	0	0	0
13-Sep-85	3	2	2	1000	1020	25	20	3	200	4
13-Sep-85	4	7	2	1045	1105	15	4	0	47	2
13-Sep-85	5	13	2	1130	1150	225	30	0	70	6
13-Sep-85	6	16	1	1230	1250	100	70	0	325	10
18-Sep-85	1	8	2	842	920	40	10	0	0	0
18-Sep-85	2	14	2	950	1005	23	6	1	2	0
18-Sep-85	3	5	2	1030	1052	5	5	1	4	0
18-Sep-85	4	9	2	1105	1125	15	4	0	15	0
18-Sep-85	5	1	2	1205	1216	4	0	3	0	0
18-Sep-85	6	16	2	1236	1250	2	2	0	2	0
19-Sep-85	1	5	2	755	812	52	11	0	17	1
19-Sep-85	2	8	2	852	911	50	10	1	0	0
19-Sep-85	3	9	2	940	957	8	0	0	1	0
19-Sep-85	4	11	2	1050	1110	20	0	1	0	0
19-Sep-85	5	7	2	1405	1416	0	1	0	1	0
19-Sep-85	6	1	2	1517	1527	1	0	0	0	0

Appendix A. Cont'd

Date	Set #	Loc. Code	Key Code	Set Time Start	Set Time Finish	Catch Chum	Coho	Chin	Pink	Sock
20-Sep-85	1	10	1	720	738	0	0	0	0	0
20-Sep-85	2	14	2	800	812	21	1	0	7	0
20-Sep-85	3	5	2	840	900	20	1	0	4	0
20-Sep-85	4	9	2	925	940	4	0	0	10	0
20-Sep-85	5	8	2	955	1012	25	4	0	12	0
20-Sep-85	6	1	2	1050	1110	1	0	0	5	0
23-Sep-85	1	10	2	930	950	0	0	1	0	0
23-Sep-85	2	14	2	1012	1026	1	1	0	10	0
23-Sep-85	3	5	2	1048	1106	0	0	0	0	0
23-Sep-85	4	11	2	1150	1212	0	0	0	1	0
23-Sep-85	5	6	2	1255	1312	8	2	0	7	0
23-Sep-85	6	8	2	1344	1359	250	10	0	50	0
24-Sep-85	1	1	2	835	850	100	2	0	1	0
24-Sep-85	2	13	2	945	1002	2500	20	0	500	0
24-Sep-85	3	7	2	1027	1044	60	0	0	5	0
24-Sep-85	4	9	2	1140	1156	350	0	0	20	0
24-Sep-85	5	6	2	1336	1343	6	1	0	6	0
24-Sep-85	6	8	2	1425	1439	200	0	0	20	0
25-Sep-85	1	2	2	840	900	250	10	0	50	0
25-Sep-85	2	10	2	1005	1022	60	2	0	0	0
25-Sep-85	3	14	2	1048	1100	10	3	0	10	0
25-Sep-85	4	5	2	1130	1149	9	2	1	7	0
25-Sep-85	5	9	2	1229	1249	300	10	0	10	0
25-Sep-85	6	8	2	1315	1329	45	2	0	5	0
26-Sep-85	1	8	2	732	745	1000	25	0	75	0
26-Sep-85	2	2	2	923	945	50	5	0	10	0
26-Sep-85	3	7	2	1005	1017	6	0	0	3	0
26-Sep-85	4	13	2	1100	1120	3000	20	5	200	0
26-Sep-85	5	5	2	1212	1228	20	3	0	2	0
26-Sep-85	6	9	2	1249	1304	60	5	0	10	0
27-Sep-85	1	8	2	717	730	450	15	0	0	0
27-Sep-85	2	12	2	747	805	60	5	0	15	0
27-Sep-85	3	3	2	855	907	300	10	0	30	0
27-Sep-85	4	14	2	958	1012	200	10	1	0	0
27-Sep-85	5	10	2	1037	1057	1000	20	0	15	0
27-Sep-85	6	5	2	1130	1144	6	1	0	6	0
30-Sep-85	1	12	2	827	842	600	0	0	0	0
30-Sep-85	2	8	2	905	920	550	5	0	1	0
30-Sep-85	3	3	2	1016	1030	2	0	0	0	0
30-Sep-85	4	2	2	1155	1214	1000	0	0	0	0
30-Sep-85	5	13	2	1337	1358	3500	10	1	10	0
30-Sep-85	6	7	2	1430	1448	1000	7	0	0	0
01-Oct-85	1	8	2	838	849	450	0	0	0	0
01-Oct-85	2	12	2	907	922	1000	0	0	0	0
01-Oct-85	3	14	2	1028	1040	6	0	0	0	0
01-Oct-85	4	10	2	1108	1127	25	0	0	0	0
01-Oct-85	5	9	2	1215	1231	10	1	0	1	0
01-Oct-85	6	13	2	1406	1425	2750	1	1	0	0
02-Oct-85	1	12	2	838	855	800	0	0	0	0
02-Oct-85	2	8	2	914	927	150	0	0	0	0
02-Oct-85	3	5	2	957	1010	25	0	0	0	0

Appendix A. Cont'd.

Date	Set #	Loc. Code	Key Code	Set Time Start	Set Time Finish	Catch Chum	Catch Coho	Catch Chin	Catch Pink	Catch Sock
02-Oct-85	4	3	2	1058	1118	10	0	0	0	0
02-Oct-85	5	9	2	1140	1156	1500	0	0	0	0
02-Oct-85	6	1	2	1300	1310	12	1	0	0	0
03-Oct-85	1	8	2	837	849	200	0	0	0	0
03-Oct-85	2	5	2	1018	1036	85	2	0	0	0
03-Oct-85	3	14	2	1123	1133	1	2	0	0	0
03-Oct-85	4	10	2	1221	1246	87	1	0	0	0
03-Oct-85	5	13	2	1457	1516	800	20	3	0	0
03-Oct-85	6	7	2	1544	1600	100	0	0	1	0
04-Oct-85	1	6	2	720	739	90	5	0	1	0
04-Oct-85	2	4	2	808	825	150	0	0	0	0
04-Oct-85	3	9	2	845	900	500	0	0	0	0
04-Oct-85	4	11	2	945	1000	75	0	0	0	0
04-Oct-85	5	7	2	1030	1042	4	3	0	0	0
04-Oct-85	6	1	2	1115	1133	50	0	0	0	0
10-Oct-85	1	13	2	947	1007	45	2	0	0	0
11-Oct-85	2	7	2	925	943	25	0	0	0	0
11-Oct-85	3	13	2	1017	1038	5000	0	0	0	0
11-Oct-85	4	1	2	1112	1136	0	0	0	0	0
11-Oct-85	5	5	2	1225	1242	200	0	0	0	0
11-Oct-85	6	8	2	1305	1323	100	0	0	0	0
12-Oct-85	1	2	2	902	933	523	0	0	0	0
12-Oct-85	2	13	2	1048	1113	1421	0	0	0	0
12-Oct-85	3	14	2	1247	1305	15	2	1	0	0
12-Oct-85	4	5	2	1334	1350	47	0	0	0	0
12-Oct-85	5	6	2	1427	1445	54	8	0	0	0
12-Oct-85	6	8	2	1514	1527	11	2	0	0	0
13-Oct-85	1	3	2	834	850	2	0	0	0	0
13-Oct-85	2	2	2	1000	1021	503	5	0	0	0
13-Oct-85	3	7	2	1052	1111	40	0	0	0	0
13-Oct-85	4	11	2	1244	1258	41	0	0	0	0
13-Oct-85	5	9	2	1444	1503	58	0	0	0	0
13-Oct-85	6	8	2	1527	1541	0	0	0	1	0
14-Oct-85	1	8	2	838	853	3	0	0	0	0
14-Oct-85	2	9	2	915	931	4	0	0	0	0
14-Oct-85	3	2	2	1945	1102	54	0	0	0	0
14-Oct-85	4	13	2	1240	1300	250	0	0	0	0
14-Oct-85	5	17	2	1330	1347	900	0	0	0	0
14-Oct-85	6	1	2	1435	1452	300	0	0	0	0
15-Oct-85	1	8	2	837	849	34	0	0	0	0
15-Oct-85	2	9	2	912	924	12	0	0	0	0
15-Oct-85	3	3	2	957	1014	1500	0	0	0	0
15-Oct-85	4	5	2	1125	1138	200	0	0	0	0
15-Oct-85	5	10	2	1223	1239	25	0	0	0	0
15-Oct-85	6	1	2	1350	1401	12	0	0	0	0
16-Oct-85	1	12	2	836	847	200	0	0	0	0
16-Oct-85	2	8	2	909	919	100	0	1	0	0
16-Oct-85	3	9	2	947	1000	500	0	0	0	0
16-Oct-85	4	3	2	1031	1048	2	2	0	0	0
16-Oct-85	5	2	2	1150	1207	1200	0	0	0	0
16-Oct-85	6	13	2	1305	1323	2500	1	2	0	0

Appendix A. Cont'd.

Date	Set #	Loc. Code	Key Code	Set Time Start	Set Time Finish	Catch Chum	Coho	Chin	Pink	Sock
17-Oct-85	1	5	2	842	857	60	0	1	0	0
17-Oct-85	2	9	2	928	941	600	0	0	0	0
17-Oct-85	3	8	2	1000	1019	20	0	0	0	0
17-Oct-85	4	3	2	1107	1122	50	0	0	0	0
17-Oct-85	5	11	2	1219	1230	100	0	0	0	0
17-Oct-85	6	13	2	1334	1349	3000	0	1	0	0
18-Oct-85	1	14	2	732	751	100	0	0	0	0
18-Oct-85	2	5	2	823	831	100	0	0	0	0
18-Oct-85	3	9	2	903	922	100	0	0	0	0
18-Oct-85	4	8	2	945	957	150	0	0	0	0
18-Oct-85	5	12	2	1017	1032	80	0	0	0	0
18-Oct-85	6	3	2	1146	1200	1	1	1	0	0
21-Oct-85	1	11	2	1040	1059	40	1	0	0	0
22-Oct-85	1	13	2	900	915	300	0	0	0	0
22-Oct-85	2	7	2	957	1010	170	0	1	0	0
22-Oct-85	3	1	2	1033	1050	2	0	0	0	0
22-Oct-85	4	5	2	1130	1150	250	0	0	0	0
22-Oct-85	5	14	2	1225	1238	0	0	0	0	0
22-Oct-85	6	8	2	1313	1330	10	0	0	0	0
23-Oct-85	1	13	1	919	937	1200	0	0	0	0
23-Oct-85	2	7	2	1012	1030	30	1	0	0	0
23-Oct-85	3	1	2	1048	1105	1000	0	0	0	0
23-Oct-85	4	5	2	1150	1208	0	0	0	0	0
23-Oct-85	5	9	2	1243	1258	3	0	0	0	0
23-Oct-85	6	8	2	1315	1330	170	0	0	0	0
24-Oct-85	1	2	2	800	817	175	0	0	0	0
24-Oct-85	2	7	2	843	900	100	0	0	0	0
24-Oct-85	3	13	2	945	1004	350	0	1	0	0
24-Oct-85	4	1	2	1040	1157	60	0	0	0	0
24-Oct-85	5	17	2	1123	1138	800	0	0	0	0
24-Oct-85	6	9	2	1219	1235	3	0	0	0	0
25-Oct-85	1	10	2	805	820	0	0	0	0	0
25-Oct-85	2	14	2	845	858	45	0	0	0	0
25-Oct-85	3	5	2	915	935	5	0	0	0	0
25-Oct-85	4	9	2	959	1012	1	1	0	0	0
25-Oct-85	5	7	2	1042	1059	0	0	0	0	0
25-Oct-85	6	17	2	1116	1132	300	0	1	0	0
28-Oct-85	1	8	2	739	750	60	0	0	0	0
28-Oct-85	2	3	2	812	827	4	0	0	0	0
28-Oct-85	3	11	2	930	947	25	0	0	0	0
28-Oct-85	4	7	2	1043	1059	6	0	0	0	0
28-Oct-85	5	5	2	1155	1208	1	0	0	0	0
28-Oct-85	6	6	2	1228	1247	40	0	0	0	0
29-Oct-85	1	3	2	835	855	500	0	0	0	0
29-Oct-85	2	11	2	959	1017	6	0	0	0	0
30-Oct-85	1	8	2	747	804	120	0	0	0	0
30-Oct-85	2	9	2	827	839	21	1	0	0	0
30-Oct-85	3	3	2	905	923	0	0	0	0	0
30-Oct-85	4	13	2	1020	1040	1	0	0	0	0
30-Oct-85	5	7	2	1057	1115	200	0	0	0	0
30-Oct-85	6	17	2	1140	1157	2	0	0	0	0

Appendix A. Catch summary of upper Johnstone Strait chum test fishing, 1985. (Vessel #2)

Date	Chum catch	# of sets	Average catch	Date	Chum catch	# of sets	Average catch
02-Sep-85				09-Oct-85			
03-Sep-85				10-Oct-85	2007	4	501.8
04-Sep-85				11-Oct-85	1135	6	189.2
05-Sep-85				12-Oct-85	3610	6	601.7
06-Sep-85				13-Oct-85	5700	6	950.0
Total 9/1	0	0		Total 10/2	12452	22	566.0
09-Sep-85				14-Oct-85	1819	6	303.2
10-Sep-85				15-Oct-85	2369	5	473.8
11-Sep-85				16-Oct-85	3362	6	560.3
12-Sep-85				17-Oct-85	796	6	132.7
13-Sep-85				18-Oct-85	2612	4	653.0
Total 9/2	0	0		Total 10/3	10958	27	405.9
16-Sep-85				21-Oct-85	2000	2	1000.0
17-Sep-85				22-Oct-85	3218	6	536.3
18-Sep-85				23-Oct-85	7125	6	1187.5
19-Sep-85				24-Oct-85	4953	6	825.5
20-Sep-85				25-Oct-85	1211	6	201.8
Total 9/3	0	0		Total 10/4	18507	26	711.8
23-Sep-85				28-Oct-85			
24-Sep-85	660	6	110.0	29-Oct-85			
25-Sep-85	2240	6	373.3	30-Oct-85	1775	6	295.8
26-Sep-85	1905	6	317.5	31-Oct-85	2	2	1.0
27-Sep-85	1865	6	310.8	01-Nov-85			
Total 9/4	6670	24	277.9	Total 10/5	1777	8	222.1
30-Sep-85	1239	6	206.5	04-Nov-85			
01-Oct-85	4717	6	786.2	05-Nov-85			
02-Oct-85	6390	6	1065.0	06-Nov-85			
03-Oct-85	2059	6	343.2	07-Nov-85			
04-Oct-85	4200	6	700.0	08-Nov-85			
Total 10/1	18605	30	620.2	Total 11/1	0	0	

Appendix A. Summary of upper Johnstone Strait seine set locations, 1985. (Vessel #2)

Set location	Loc. Code	# of sets	% of sets
Total # of sets =		137	100.0%
Big Bay	1	0	0.0%
The Bluff	2	0	0.0%
Blow Hole	3	0	0.0%
Blue Line	4	0	0.0%
Bold Point	5	0	0.0%
China Town	6	0	0.0%
Cracroft	7	13	9.5%
Double Bay	8	0	0.0%
Kelp Point	9	0	0.0%
Merry Go Round	10	0	0.0%
Parsons Bay	11	0	0.0%
Siwash Rock	12	0	0.0%
The Bank	13	0	0.0%
White Rock	14	0	0.0%
White Beach	15	0	0.0%
Blinkhorn	16	18	13.1%
Return Point	17	0	0.0%
Freshwater Bay	18	0	0.0%
Izumi Rock	19	20	14.6%
Bauza Cove	20	0	0.0%
Fine Beach (RB)	21	20	14.6%
Beaver Cove	22	0	0.0%
Nimpkish R.	23	0	0.0%
Blackrish Sound	24	0	0.0%
Mid-Summer Is.	25	0	0.0%
Broken Islands	26	0	0.0%
Beautiful Bch. (AR)	27	0	0.0%
Pig Ranch	28	14	10.2%
Glory Hole	29	20	14.6%
Hot Spot	30	22	16.1%
Boat Harbour	31	1	0.7%
Hillier Point	32	7	5.1%
Growler Cove	33	2	1.5%
Sofia Island	34	0	0.0%
No location	99	0	0.0%

Appendix A. Daily data, upper Johnstone Strait test fishing, 1985 (Vessel #2)

Date	Set #	Loc. Code	Key Code	Set Time Start	Set Time Finish	Catch Chum	Coho	Chin	Pink	Sock
24-Sep-85	1	28	2	745	805	30	0	0	15	0
24-Sep-85	2	21	2	835	850	50	2	0	10	0
24-Sep-85	3	29	2	920	940	200	15	0	25	0
24-Sep-85	4	19	2	1030	1050	50	0	0	0	0
24-Sep-85	5	30	2	1145	1205	300	10	0	35	0
24-Sep-85	6	7	2	1220	1240	30	5	0	10	0
25-Sep-85	1	19	2	720	740	90	0	0	10	0
25-Sep-85	2	30	2	800	820	650	5	2	40	1
25-Sep-85	3	7	2	850	910	125	10	0	50	1
25-Sep-85	4	28	2	945	1005	0	0	0	0	0
25-Sep-85	5	21	2	1040	1100	1000	15	0	50	5
25-Sep-85	6	16	2	1210	1230	375	10	0	15	0
26-Sep-85	1	19	2	749	805	60	10	0	2	0
26-Sep-85	2	30	2	836	854	60	3	0	0	0
26-Sep-85	3	7	2	932	947	10	0	0	10	0
26-Sep-85	4	31	2	1014	1034	375	10	0	0	0
26-Sep-85	5	21	2	1104	1124	700	5	2	5	0
26-Sep-85	6	29	2	1154	1207	700	10	0	2	0
27-Sep-85	1	30	2	755	813	500	0	0	1	0
27-Sep-85	2	7	2	840	855	15	0	0	0	0
27-Sep-85	3	28	2	934	952	75	0	0	0	0
27-Sep-85	4	21	1	1024	1054	400	0	0	10	0
27-Sep-85	5	29	1	1134	1152	175	0	0	0	0
27-Sep-85	6	19	2	1203	1235	700	7	1	2	0
30-Sep-85	1	30	2	750	805	30	0	0	0	0
30-Sep-85	2	7	2	830	850	1	1	0	0	0
30-Sep-85	3	28	2	925	945	8	0	0	2	0
30-Sep-85	4	21	2	1020	1040	500	10	0	0	0
30-Sep-85	5	29	2	1110	1130	200	5	0	0	0
30-Sep-85	6	19	2	1155	1215	500	5	0	2	0
01-Oct-85	1	29	2	750	810	1500	12	0	0	0
01-Oct-85	2	28	2	840	900	0	0	0	0	0
01-Oct-85	3	21	2	940	1000	300	6	0	0	0
01-Oct-85	4	19	2	1040	1100	2500	5	0	0	0
01-Oct-85	5	30	2	1125	1145	400	4	0	0	0
01-Oct-85	6	7	2	1215	1230	17	1	0	2	0
02-Oct-85	1	29	2	745	800	1200	10	0	0	0
02-Oct-85	2	28	2	830	845	0	0	0	0	0
02-Oct-85	3	21	2	930	950	4500	20	0	0	0
02-Oct-85	4	19	2	1045	1105	450	1	0	0	0
02-Oct-85	5	30	2	1125	1145	200	2	0	1	0
02-Oct-85	6	16	2	1215	1230	40	5	1	5	0
03-Oct-85	1	29	1	805	825	350	6	0	0	0
03-Oct-85	2	21	2	955	1015	700	0	0	0	0
03-Oct-85	3	19	1	1050	1110	9	0	0	0	0
03-Oct-85	4	30	1	1145	1200	0	0	6	0	0
03-Oct-85	5	7	2	1305	1325	1000	0	0	0	0
03-Oct-85	6	28	2	1405		0	0	0	0	0
04-Oct-85	1	29	2	705	725	700	0	0	0	0

Appendix A. Cont'd.

Date	Set #	Loc. Code	Key Code	Set Time Start	Set Time Finish	Catch Chum	Coho	Chin	Pink	Sock
04-Oct-85	2	19	2	750	805	1500	0	0	0	0
04-Oct-85	3	30	2	830	845	350	2	0	0	0
04-Oct-85	4	28	2	925	940	50	2	0	0	0
04-Oct-85	5	21	2	1015	1035	1200	0	0	0	0
04-Oct-85	6	16	2	1135	1155	400	6	0	0	0
10-Oct-85	1	28	1	905	920	3	0	0	0	0
10-Oct-85	2	21	2	1155	1215	4	1	0	0	0
10-Oct-85	3	30	2	1305	1325	0	0	0	0	0
10-Oct-85	4	16	2	1400		2000	6	0	0	0
11-Oct-85	1	29	2	845	905	6	0	0	0	0
11-Oct-85	2	21	2	935	955	75	1	0	0	0
11-Oct-85	3	28	2	1030	1045	1	0	0	1	0
11-Oct-85	4	19	2	1115	1135	3	0	0	1	0
11-Oct-85	5	30	2	1200	1220	700	0	0	0	0
11-Oct-85	6	16	2	1255	1310	350	0	0	0	0
12-Oct-85	1	29	2	840	855	1000	2	0	0	0
12-Oct-85	2	21	2	925	945	1000	0	0	0	0
12-Oct-85	3	19	2	1025	1045	250	0	0	0	0
12-Oct-85	4	7	1	1120	1135	10	1	0	1	0
12-Oct-85	5	32	1	1215	1230	750	0	0	0	0
12-Oct-85	6	16	2	1305	1325	600	0	0	0	0
13-Oct-85	1	29	2	840	900	1500	4	0	1	0
13-Oct-85	2	21	2	935	955	750	0	0	0	0
13-Oct-85	3	19	2	1040	1100	2000	10	6	1	0
13-Oct-85	4	30	2	1120	1140	700	0	0	0	0
13-Oct-85	5	32	2	1220	1240	500	0	0	0	0
13-Oct-85	6	16	2	1305	1325	250	0	0	0	0
14-Oct-85	1	29	2	850	905	358	0	0	0	0
14-Oct-85	2	21	2	1000	1020	0	0	0	0	0
14-Oct-85	3	19	2	1100	1120	1445	1	1	0	0
14-Oct-85	4	30	1	1215	1235	7	1	0	0	0
14-Oct-85	5	32	2	1320	1340	5	0	0	0	0
14-Oct-85	6	16	2	1405	1425	4	0	2	0	0
15-Oct-85	1	21	1	905	925	60	0	0	0	0
15-Oct-85	2	29	2	1000	1020	318	1	0	0	0
15-Oct-85	3	30	2	1100	1120	1530	2	1	0	0
15-Oct-85	4	7	2	1220	1235	261	0	0	0	0
15-Oct-85	5	16	2	1315	1325	200	0	0	0	0
16-Oct-85	1	21	2	925	945	60	0	0	0	0
16-Oct-85	2	29	2	1020	1040	1200	0	0	0	0
16-Oct-85	3	30	2	1110	1125	1000	1	0	0	0
16-Oct-85	4	19	2	1155	1210	1000	0	0	0	0
16-Oct-85	5	32	1	1250	1305	100	0	0	0	0
16-Oct-85	6	16	1	1330	1350	2	0	0	0	0
17-Oct-85	1	28	2	915	925	3	0	0	0	0
17-Oct-85	2	21	2	1005	1020	100	1	0	0	0
17-Oct-85	3	29	1	1055	1110	40	0	0	0	0
17-Oct-85	4	30	2	1140	1155	500	0	0	0	0

Appendix A. Cont'd.

Date	Set #	Loc. Code	Key Code	Set Time Start	Set Time Finish	Catch Chum	Catch Coho	Catch Chin	Catch Pink	Catch Sock
17-Oct-85	5	19	1	1225		150	0	0	0	0
17-Oct-85	6	7	2	1330	1350	3	1	0	0	0
18-Oct-85	1	16	2	735	755	1100	0	0	0	0
18-Oct-85	2	30	2	840	855	1500	0	0	0	0
18-Oct-85	3	33	2	1015	1025	9	0	1	0	0
18-Oct-85	4	7	2	1050	1105	3	1	0	0	0
21-Oct-85	1	16	2	1100	1115	1500	0	0	0	0
21-Oct-85	2	32	2	1145	1200	500	0	0	0	0
22-Oct-85	1	16	2	830	845	1000	0	0	0	0
22-Oct-85	2	29	2	940	1000	15	1	0	0	0
22-Oct-85	3	21	2	1030	1050	2	0	0	0	0
22-Oct-85	4	19	2	1120	1135	1300	0	0	0	0
22-Oct-85	5	30	1	1200	1220	1	0	0	0	0
22-Oct-85	6	32	2	1245	1300	900	0	1	0	0
23-Oct-85	1	7	2	855	910	500	0	0	0	0
23-Oct-85	2	28	2	950	1005	25	0	0	0	0
23-Oct-85	3	29	2	1035	1055	250	0	0	0	0
23-Oct-85	4	19	2	1115	1135	5000	0	0	0	0
23-Oct-85	5	30	2	1215	1230	1000	0	0	0	0
23-Oct-85	6	16	2	1305	1325	350	0	0	0	0
24-Oct-85	1	28	2	915	935	3	0	0	0	0
24-Oct-85	2	21	2	1005	1020	0	0	0	0	0
24-Oct-85	3	29	2	1050	1110	350	0	0	0	0
24-Oct-85	4	19	2	1140	1200	600	0	2	0	0
24-Oct-85	5	30	2	1220	1240	2000	0	0	0	0
24-Oct-85	6	16	2	1325	1345	2000	0	0	0	0
25-Oct-85	1	30	2	755	815	150	0	1	0	0
25-Oct-85	2	29	2	840	900	30	0	0	0	0
25-Oct-85	3	19	2	940	1000	30	0	0	0	0
25-Oct-85	4	33	2	1035	1050	1	0	0	0	0
25-Oct-85	5	32	2	1120	1140	200	0	0	0	0
25-Oct-85	6	16	2	1205	1225	800	0	0	0	0
30-Oct-85	1	16	2	740	800	250	0	0	0	0
30-Oct-85	2	28	2	850	905	100	0	0	0	0
30-Oct-85	3	21	1	940	1000	0	0	0	0	0
30-Oct-85	4	29	2	1025	1045	900	1	0	0	0
30-Oct-85	5	19	2	1135	1155	450	0	0	0	0
30-Oct-85	6	30	2	1215	1235	75	0	0	0	0
31-Oct-85	1	16	1	740	800	1	0	0	0	0
31-Oct-85	2	7	2	1000	1015	1	0	0	0	0

Appendix A. Catch summary of lower Johnstone Strait chum test fishing, 1985.

Date	Chum catch	# Of sets	Average catch	Date	Chum catch	# of sets	Average catch
02-Sep-85				08-Oct-85			
03-Sep-85				09-Oct-85			
04-Sep-85				10-Oct-85	1800	5	360.0
05-Sep-85				11-Oct-85	1625	5	325.0
06-Sep-85				12-Oct-85	15000	5	3000.0
Total 9/1	0	0		Total 10/2	18425	15	1228.3
09-Sep-85				14-Oct-85			
10-Sep-85				15-Oct-85	4400	2	2200.0
11-Sep-85				16-Oct-85	3750	5	750.0
12-Sep-85				17-Oct-85	6500	5	1300.0
13-Sep-85				18-Oct-85			
Total 9/2	0	0		Total 10/3	14650	12	1220.8
16-Sep-85				21-Oct-85	5650	4	1412.5
17-Sep-85				22-Oct-85	9050	5	1810.0
18-Sep-85				23-Oct-85	8125	5	1625.0
19-Sep-85				24-Oct-85			
20-Sep-85				25-Oct-85			
Total 9/3	0	0		Total 10/4	22825	14	1630.4
23-Sep-85	840	4	210.0	28-Oct-85	10250	4	2562.5
24-Sep-85	3500	5	700.0	29-Oct-85	19500	5	3900.0
25-Sep-85	1650	5	330.0	30-Oct-85	2620	5	524.0
26-Sep-85				31-Oct-85			
27-Sep-85				01-Nov-85			
Total 9/4	5990	14	427.9	Total 10/5	32370	14	2312.1
30-Sep-85	6550	5	1310.0	04-Nov-85	7850	5	1570.0
01-Oct-85	8855	5	1771.0	05-Nov-85	900	3	300.0
02-Oct-85	710	5	142.0	06-Nov-85	5350	5	1070.0
03-Oct-85				07-Nov-85			
04-Oct-85				08-Nov-85			
Total 10/1	16115	15	1074.3	Total 11/1	14100	13	1084.6

Appendix A. Summary of lower Johnstone Strait seine set locations, 1985.

Set location	Loc. Code	# of sets	% of total
Total # of sets =		97	100.0%
Bear Bight	1	13	13.4%
Camp Point	2	13	13.4%
Granite Point	3	3	3.1%
Green Sea Bay	4	6	6.2%
Nodales Channel	5	0	0.0%
Ripple Point	6	0	0.0%
The Slides	7	10	10.3%
Palmer Bay	8	5	5.2%
Deepwater Bay	9	11	11.3%
Okisollo Channel	10	0	0.0%
Elk Bay	11	0	0.0%
Chancellor Channel	12	1	1.0%
Humpback Bay	13	10	10.3%
Cinque Island	14	0	0.0%
Kanish Bay	15	4	4.1%
Howe Island	16	0	0.0%
Blind Channel	17	0	0.0%
Knox Bay	18	0	0.0%
Chatham Point	19	0	0.0%
Bodega Point	20	3	3.1%
Little Bear Bay	21	12	12.4%
Rock Bay	22	6	6.2%
No location	99	0	0.0%

Appendix A. Daily data, lower Johnstone Strait test fishing, 1985.

Date	Set #	Loc. Code	Key Code	Set Time Start	Set Time Finish	Catch Chum	Coho	Chin	Pink	Sock
23-Sep-85	1	9	2	1235	1255	400	100	0	50	5
23-Sep-85	2	4	2	1420	1440	40	10	0	0	0
23-Sep-85	3	15	2	1630	1650	300	10	0	40	0
23-Sep-85	4	8	2	1905	1920	100	0	0	10	0
24-Sep-85	1	2	2	725	740	700	70	1	70	0
24-Sep-85	2	8	2	900	920	1000	50	1	50	0
24-Sep-85	3	21	2	1030	1050	400	10	1	10	0
24-Sep-85	4	1	2	1130	1145	800	100	0	0	0
24-Sep-85	5	7	2	1445	1500	600	40	0	100	1
25-Sep-85	1	7	2	850	920	400	40	0	50	0
25-Sep-85	2	1	2	1020	1040	400	20	0	100	0
25-Sep-85	3	21	2	1110	1130	350	20	1	150	0
25-Sep-85	4	3	2	1300	1325	250	10	1	20	0
25-Sep-85	5	9	2	1415	1450	250	10	0	10	0
30-Sep-85	1	9	2	910	930	1400	50	1	50	0
30-Sep-85	2	3	2	1020	1040	250	10	1	20	0
30-Sep-85	3	4	2	1130	1150	700	20	0	20	0
30-Sep-85	4	22	2	1310	1335	3500	0	0	0	0
30-Sep-85	5	1	2	1510	1530	700	20	0	2	1
01-Oct-85	1	2	2	705	720	5	1	0	7	0
01-Oct-85	2	7	2	1320	1340	4000	20	2	100	0
01-Oct-85	3	13	2	1420	1435	1200	20	1	50	0
01-Oct-85	4	21	2	1510	1530	3000	10	1	30	0
01-Oct-85	5	1	2	1605	1625	650	10	0	10	0
02-Oct-85	1	7	2	710	725	150	6	0	10	0
02-Oct-85	2	21	2	1215	1240	50	5	1	5	0
02-Oct-85	3	22	2	1410	1445	100	5	0	5	0
02-Oct-85	4	4	2	1520	1540	400	5	0	5	0
02-Oct-85	5	9	2	1655	1715	10	0	0	0	0
10-Oct-85	1	9	2	815	825	1400	0	0	0	0
10-Oct-85	2	20	2	920	945	150	0	0	0	0
10-Oct-85	3	15	2	1030	1050	250	0	0	0	0
10-Oct-85	4	4	2	1400	1420	0	0	0	0	0
10-Oct-85	5	21	2	1555	1615	0	0	0	0	0
11-Oct-85	1	21	2	645	700	250	0	0	0	0
11-Oct-85	2	7	2	830	850	500	0	0	0	0
11-Oct-85	3	1	2	1000	1020	75	0	0	0	0
11-Oct-85	4	13	2	1100	1120	500	0	0	0	0
11-Oct-85	5	2	2	1315	1330	300	0	0	0	0
12-Oct-85	1	2	2	920	945	3000	0	0	0	0
12-Oct-85	2	13	2	1050	1105	5000	0	0	0	0
12-Oct-85	3	1	2	1145	1205	5000	0	0	0	0
12-Oct-85	4	21	2	1240	1255	2000	0	0	0	0
12-Oct-85	5	9	2	1510	1530	0	0	0	0	0
15-Oct-85	1	2	2	1135	1155	400	0	0	0	0
15-Oct-85	2	13	2	1245	1250	4000	0	0	0	0
16-Oct-85	1	7	2	610	620	300	0	0	0	0
16-Oct-85	2	21	2	1025	1045	1500	0	0	0	0

Appendix A. Cont'd.

Date	Set #	Loc. Code	Key Code	Set Time Start	Set Time Finish	Catch Chum	Coho	Chin	Pink	Sock
16-Oct-85	3	22	2	1220	1240	300	0	0	0	0
16-Oct-85	4	20	2	1350	1410	150	0	0	0	0
16-Oct-85	5	9	2	1450	1500	1500	0	0	0	0
17-Oct-85	1	12	2	700	725	200	0	0	0	0
17-Oct-85	2	21	2	1210	1225	500	0	0	0	0
17-Oct-85	3	7	2	1320	1340	2000	0	0	0	0
17-Oct-85	4	13	2	1430	1450	800	0	0	0	0
17-Oct-85	5	1	2	1525	1545	3000	0	0	0	0
21-Oct-85	1	9	2	850	900	3000	0	0	0	0
21-Oct-85	2	4	2	1055	1125	2000	0	0	0	0
21-Oct-85	3	21	2	1430	1450	500	0	0	0	0
21-Oct-85	4	2	2	1645	1700	150	0	0	0	0
22-Oct-85	1	2	2	630	645	3000	0	0	0	0
22-Oct-85	2	2	2	715	730	1000	0	0	0	0
22-Oct-85	3	13	2	830	850	5000	0	0	0	0
22-Oct-85	4	1	2	930	950	0	0	0	0	0
22-Oct-85	5	7	2	1055	1105	50	0	0	0	0
23-Oct-85	1	7	2	615	635	200	0	0	0	0
23-Oct-85	2	8	2	655	715	25	0	0	0	0
23-Oct-85	3	13	2	745	805	400	0	0	0	0
23-Oct-85	4	22	2	900	910	6000	0	0	0	0
23-Oct-85	5	9	2	1030	1050	1500	0	0	0	0
28-Oct-85	1	22	2	1100	1120	500	0	0	0	0
28-Oct-85	2	13	2	1240	1300	4000	0	0	0	0
28-Oct-85	3	1	2	1330	1350	5000	0	0	0	0
28-Oct-85	4	2	2	1520	1540	750	0	0	0	0
29-Oct-85	1	22	2	930	950	0	0	0	0	0
29-Oct-85	2	2	2	1135	1145	3500	0	0	0	0
29-Oct-85	3	2	2	1235	1255	6000	0	0	0	0
29-Oct-85	4	13	2	1345	1405	4000	0	0	0	0
29-Oct-85	5	1	2	1440	1500	6000	0	0	0	0
30-Oct-85	1	21	2	805	820	100	0	0	0	0
30-Oct-85	2	3	2	940	1000	100	0	0	0	0
30-Oct-85	3	15	2	1035	1055	2000	0	0	0	0
30-Oct-85	4	20	2	1215	1230	400	0	0	0	0
30-Oct-85	5	9	2	1330	1350	20	0	0	0	0
04-Nov-85	1	9	2	906	925	4000	1	0	0	0
04-Nov-85	2	15	2	1017	1036	400	1	0	0	0
04-Nov-85	3	4	2	1140	1158	450	0	0	0	0
04-Nov-85	4	21	2	1245	1301	2000	0	1	0	0
04-Nov-85	5	8	2	1402	1420	1000	0	0	0	0
05-Nov-85	1	2	2	712	730	250	0	1	0	0
05-Nov-85	2	1	2	932	950	500	0	0	0	0
05-Nov-85	3	2	2	1056	1127	150	0	0	0	0
06-Nov-85	1	13	2	700	720	3000	0	0	0	0
06-Nov-85	2	1	2	757	818	1000	0	0	0	0
06-Nov-85	3	1	2	848	906	50	0	1	0	0
06-Nov-85	4	8	2	945	956	600	0	0	0	0
06-Nov-85	5	7	2	1045	1104	700	0	0	0	0

Appendix B. Weekly age class information from the upper Johnstone Strait chum test fishery, 1985.

Date	Week	Number sampled	Age			Percent at age			CPUE[a]		Weighted % at age[b]		
			3	4	5	3	4	5	CPUE	% Total	3	4	5
Upper Johnstone Strait													
Sep 1- 7	9/1	98	14	82	2	14.2	83.7	2.0	7.1	0.4	0.1	0.3	0.0
Sep 8-14	9/2	99	19	77	3	19.2	77.8	3.0	29.3	1.4	0.3	1.1	0.0
Sep 15-21	9/3	100	19	74	7	19,0	74.0	7.0	16.2	0.8	0.2	0.6	0.1
Sep 22-28	9/4	98	20	75	3	20.4	76.5	3.1	343.4	17.0	3.5	13.0	0.5
Sep 29- 5	10/1	98	34	62	2	34.7	63.3	2.0	517.7	25.6	8.9	16.2	0.5
Oct 6-12	10/2	98	39	55	4	39.8	56.1	4.1	439.0	21.7	8.6	12.2	0.9
Oct 13-19	10/3	99	47	51	1	47.5	51.5	1.0	405.2	20.0	9.5	10.3	0.2
Oct 20-26	10/4	98	44	54	0	44.9	55.1	0.0	192.8	9.5	4.3	5.3	0.0
Oct 27- 2	10/5	97	55	42	0	56.7	43.3	0.0	70.4	3.5	2.0	1.5	0.0
Percent of total									2021.5		37.3	60.5	2.2

[a]CPUE & % Total = weekly test fishing CPUE expressed as % of total weekly test fishing CPUE.

[b]Weighted % at age = weekly age class proportion as % of total stock size.

NOTE: Upper Johnstone Strait test fishing and age class data are used to determine the seasonal age structure.

Appendix C. Annual Study Area age class analysis as determined from upper Johnstone Strait test fishery or commercial catch sampling.

Year	Age 3	Age 4	Age 5	Age 6
1958	43.5	56.5	0.0	0.0
1959	33.2	64.6	2.2	0.0
1960	38.9	60.2	0.9	0.0
1961	11.1	87.0	1.9	0.0
1962	79.4	19.0	1.7	0.0
1963	34.9	64.6	0.5	0.0
1964	22.9	76.4	0.7	0.0
1965	35.8	61.9	2.3	0.0
1966	17.9	81.2	0.9	0.0
1967	62.7	35.9	1.3	0.0
1968	16.8	82.7	0.5	0.0
1969	45.9	50.4	3.7	0.0
1970	8.5	90.5	0.9	0.0
1971	41.7	47.5	10.8	0.0
1972	7.1	91.0	1.8	0.0
1973	2.6	80.8	16.6	0.0
1974	20.4	53.1	26.2	0.4
1975	57.8	38.8	3.4	0.0
1976	14.8	83.8	1.4	0.0
1977	23.4	74.3	2.2	0.0
1978	14.3	83.7	2.1	0.0
1979	36.4	46.9	16.8	0.0
1980	28.3	71.0	0.8	0.0
1981	13.8	79.5	6.7	0.0
1982	20.7	74.8	4.5	0.0
1983	17.5	55.9	26.6	0.0
1984	49.2	46.0	4.5	0.2
1985	37.3	60.5	2.2	0.0
Average	29.9	64.9	5.1	0.0
Average odd years	32.4	60.6	6.9	0.0
Average even years	27.3	69.3	3.3	0.0

Appendix D. Annual summary of total effort and catch per unit of effort of chum salmon in both sets for Cottonwood and Albion, 1963 to 1985.

Year	Total Effort	Chum Effort
Cottonwood		
1963	637.43	166.36
1964	NA	NA
1965	753.53	108.24
1966	795.98	305.36
1967	696.30	152.62
1968	756.75	372.92
1969	593.48	220.95
1970	701.48	463.02
1971	764.93	313.16
1972	451.88	358.06
1973	603.38	292.69
1974	714.30	309.00
1975	817.05	151.71
1976	622.80	339.67
1977	766.58	488.45
1978	798.75	518.87
1979	909.08	257.13
1980	952.73	303.59
1981	912.83	224.88
1982	723.60	217.71
1983	719.10	250.59
1984	923.03	503.90
1985	623.24	431.48
ALBION		
1979	843.08	248.13
1980	907.20	303.37
1981	857.55	321.52
1982	947.18	392.28
1983	905.70	369.55
1984	985.28	504.21
1985	787.96	586.34

Note: CPUE = (Catch (Pieces) * fishing time (mins) * 1000 / net length.

Appendix E. Commercial net fishing days, number of boats, and major regulations by statistical area for the 1985 chum salmon season.

Week ending	Days fishing GN	Days fishing SN	# of Vessels GN	# of Vessels SN	Major regulations and changes to proposed fishing times
Area 12					
Sept. 7	2.5	2.0	104	219	Area 12-2, 12-7 & 12-13 closed due to Fraser sockeye migration ceased. Prevent targeting on local chums Area 12-35 opened to harvest surplus.
Sept. 14	2.5	2.0	150	192	Announced additional days fishing prior to pening to provide for further Fraser River pink harvesting. Area 12-18 open to increase harvest area for Fraser River pinks.
Sept. 21	1.5	1.0	152	181	Ribbon boundary not in effect for chum season index fishery.
Sept. 28	Closed				
Oct. 5	Closed				
Oct. 12	1.5	1.0	284	237	Area 12-1 to 12-13, 12-18, 12-20, 12-21, 12-24 open for chum fishing.
Area 13					
Sept. 7	2.5	2.0	47	70	
Sept. 14	2.5	2.0	39	93	Okisolo Channel (13-10) opened to provide additional harvest area for Fraser River pinks. Mainland pinks behind boundaries.
Sept. 21	1.5	1.0	25	86	As above (13-10). Nodales Channel mouth open as Area 13 pinks behind boundaries. Fall chum boundary.
Sept. 28	Closed				Ribbon boundary not in effect for chum season index fishery.
Oct. 5	Closed				
Oct. 12	1.5	1.0	187	184	Areas 13-7 to 13-10 and 13-27 to 13-29, 13-31, 13-32, 13-35 and 13-40 open to chum salmon fishing.

Appendix E cont'd.

Week ending	Days fishing		# of Vessels		Major regulations and changes to proposed fishing times
	GN	SN	GN	SN	
Area 14					
Oct. 12	1.67	Closed	380		Areas open 14-5, 14-7, 14-8 to gillnets.
Oct. 19	2.0	Closed	380		Areas open 14-4, 14-5, 14-7, 14-11 to gillnets.
Oct. 26	1.1	Closed	368		Areas open 14-4, 14-5, 14-7, 14-9 to 14-11 to gillnets
Nov. 2	2.0	Closed	195		Areas 14-4, 14-5, 14-7 and 14-11.
Nov. 9	1.0	1.0	102	160	Areas 14-4, 14-5, and 14-11 to gillnets and seines separately.
Area 29					
Oct. 12	0.5	Closed	422		Areas open 29-1 to 29-7 and 29-9 to 29-17 to gillnets.
Nov. 23	0.5	Closed	185		Areas open 29-11 to 29-17.

Appendix F. CHUM SALMON ESCAPEMENT IN THOUSANDS, RECORDED BY STREAM AND TOTALLED BY SUBAREA

SUBAREA - RIVER	CAPACITY	1985	1984	1983	1982	1981	1980	1970-79 AVERAGE	1960-69 AVERAGE	1950-59 AVERAGE
UPPER VAN. IS.										
CLUXEWE R.		0.1	0.1	0.1	N/O	N/O	N/O	0.2	0.8	3.5
KEOGH R.		0.5	N/A	N/O	N/O	N/O	N/O	0.4	1.9	5.0
NAHWITTI R.		N/O	N/A	N/O	N/O	N/O	N/O	0.1	0.3	1.8
QUATSE R.		0.3	0.3	0.2	N/O	N/O	N/O	0.5	5.1	7.8
STRANBY R.		N/O	N/O	N/O	N/O	N/O	N/O	0.1	0.0	5.1
TSULQUATE R.		N/A	N/O	N/O	N/O	N/O	N/O	0.2	0.6	1.2
MISC.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.8
TOTAL	32.9	0.9	0.4	0.3	0.0	0.0	0.0	1.4	9.0	25.1
KINGCOME INLET										
EMBLY CR.		0.0	N/A	N/O	N/O	N/O	N/O	0.1	1.9	9.1
KINGCOME R.		0.4	0.3	N/O	3.3	N/O	10.0	22.0	11.2	19.1
MCKENZIE R.		1.3	4.8	3.5	5.0	6.0	0.6	6.6	4.0	19.1
NIMMO R.		0.5	0.3	0.4	0.3	0.3	0.3	2.4	1.8	4.3
TSIBASS (MARION)		3.0	0.4	3.5	4.5	3.8	2.5	3.0	0.4	6.4
WAKEMAN R.		0.1	0.3	0.4	0.4	1.0	0.5	5.1	2.7	8.6
MISC.		0.5	0.4	0.2	1.0	0.5	0.3	0.5	0.1	2.7
TOTAL	113.5	5.7	6.4	8.0	14.5	11.6	14.1	39.6	22.1	69.2
BOND TO KNIGHT										
AHTA VALLEY R.		0.5	N/O	N/O	N/O	0.1	0.8	0.4	0.5	9.1
FRANKLIN R.		N/A	UN	N/O	N/O	N/O	N/O	0.4	0.9	1.4
GLENDALE R.		0.1	1.5	2.1	2.0	0.3	1.0	9.7	18.9	10.2
KAKWEIKEN R.		0.2	3.0	3.5	5.8	0.8	3.0	4.6	3.2	18.7
KLINI-KLINI R.		0.0	N/O	0.7	N/O	0.3	N/O	10.5	9.4	25.1
SHOAL HBR. LK.		1.0	5.0	0.3	0.3	0.3	0.4	1.2	1.8	5.1
VINER CR.		40.0	40.0	25.0	48.0	7.5	14.0	27.3	30.9	49.0
MAHSHIHLAS (SIM)		0.0	N/A	N/O	N/A	N/A	N/O	0.1	1.0	2.1
WATERFALL CR.		0.3	0.5	0.3	13.5	0.2	15.0	10.4	9.4	8.9
MISC.		0.6	0.3	0.6	0.3	0.2	0.5	1.7	0.7	1.9
TOTAL	220.0	43.5	50.3	32.4	69.9	9.7	34.6	66.2	76.6	131.6

Appendix F. (cont'd)

SUBAREA - RIVER	CAPACITY	1985	1984	1983	1982	1981	1980	1970-79 AVERAGE	1960-69 AVERAGE	1950-59 AVERAGE
TOBA INLET										
BREM CR.		N/O	0.0	0.1	N/O	0.0	N/O	1.2	1.5	4.4
FORBES CR.		0.4	0.1	0.5	N/A	0.7	0.6	0.9	0.5	5.2
KLITES R.		N/O	0.6	0.1	0.4	1.0	N/O	1.1	2.5	3.7
OKEOVER R.		6.5	7.2	4.5	5.1	7.2	3.0	2.1	0.8	1.9
QUATAM R.		0.2	N/O	N/O	2.5	1.2	N/O	2.6	1.1	3.3
SALT LAGOON CR.		N/A	N/A	N/A	N/A	N/O	N/O	0.0	0.1	0.7
THEODOSIA R.		3.5	3.0	2.5	2.0	4.5	1.0	3.8	5.7	17.6
TOBA R.		N/O	8.0	10.0	2.5	N/A	N/O	4.8	7.5	34.2
LITTLE TOBA R.		N/O	N/O	N/O	2.5	2.0	1.5	1.9	2.9	1.6
MISC.		1.0	N/A	0.0	0.0	1.1	0.2	0.5	0.6	1.4
TOTAL	136.0	11.6	18.9	17.7	15.0	17.7	6.3	19.0	23.2	73.9
JERVIS INLET										
ANGUS (PETE) CR.		2.4	3.0	0.6	0.5	1.6	1.6	1.3	2.2	1.3
BRITTAIN R.		0.3	0.1	0.2	N/O	0.2	0.5	0.2	0.6	1.4
CHAMBERLAIN CR. (CARLSON)		1.5	0.6	0.4	N/O	1.0	N/O	0.4	1.2	0.5
DESERTED R.		25.0	15.0	7.0	10.0	15.0	20.0	18.6	6.1	10.6
MOUAT BAY CR.		0.9	0.5	N/O	N/O	N/O	N/O	0.4	6.0	N/A
PENDER HBR. CRS. 1		17.0	17.2	10.1	1.1	3.2	5.4	7.8	4.1	4.5
SAKINAW LAKE CRS.		N/A	0.1	0.1	N/O	0.1	0.1	0.2	1.2	1.7
SALTERY BAY CR.		16.0	8.5	10.0	2.2	15.0	25.0	13.1	12.6	4.5
SHANNON CR.		0.2	0.2	0.2	N/A	0.6	N/A	0.5	0.7	0.9
SKWAWKA R.		11.0	2.0	2.0	1.2	3.0	2.0	2.2	1.5	2.3
SLIAMON CR.		45.0	28.0	16.0	8.0	12.0	11.0	7.2	4.8	13.3
SNAKE CR.		0.9	1.5	0.4	0.1	1.6	0.5	0.2	0.8	1.1
STORM BAY CR.		5.0	2.3	0.4	0.6	2.5	2.2	0.3	0.2	N/A
THUNDER BAY CR.		0.9	N/A	1.7	N/A	2.9	N/A	1.1	0.2	1.1
TZONNIE R.		30.0	20.0	12.0	19.5	23.0	20.0	11.2	15.2	17.0
VANCOUVER R.		3.0	1.2	0.0	N/O	2.0	2.5	2.3	1.4	4.1
WOLFSON (LANG) CR.		3.2	3.5	0.3	1.0	3.0	N/O	1.9	2.8	5.6
MISC.		12.4	46.5	11.8	4.4	5.8	7.7	5.2	2.4	2.5
TOTAL	149.8	174.6	150.1	73.2	48.6	92.3	98.5	74.3	63.9	72.1

Appendix F. (cont'd)

SUBAREA - RIVER	CAPACITY	1985	1984	1983	1982	1981	1980	1970-79 AVERAGE	1960-69 AVERAGE	1950-59 AVERAGE
JOHNSTONE STRAIT										
ARMOUR DE COSMOS		0.1	0.0	0.0	0.0	0.0	0.0	0.7	0.4	0.7
ADAM-EVE R.		N/O	N/O	N/O	N/O	N/O	N/O	6.0	0.8	3.1
FULMORE R.		6.0	0.3	N/O	N/O	4.2	0.5	1.2	0.9	2.8
HYACINTH R.		2.0	7.5	2.0	N/A	2.4	2.5	2.4	1.6	3.8
KOKISH R.		N/O	N/O	N/O	N/O	N/O	N/O	0.2	0.4	2.0
NIMPKISH R.		70.0	38.0	7.5	55.0	10.0	14.0	12.7	24.3	58.0
ROBBERS NOB CR.		N/A	N/A	N/O	N/A	N/A	N/O	0.0	0.0	0.0
SALMON R.		N/O	N/O	N/O	0.1	N/O	0.5	0.9	1.5	5.8
TSITIKA R.		N/O	N/A	0.0	N/O	N/O	N/O	0.1	0.0	1.0
MISC.		0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.8
TOTAL	137.0	78.4	45.8	9.5	55.1	16.6	17.5	24.2	30.1	78.1
LOUGHBOROUGH/BUTE										
APPLE R.		7.5	N/O	0.1	N/O	N/O	5.0	7.3	1.2	1.5
CHUMSACK R.		N/A	N/O	N/O	N/O	N/O	N/O	0.0	0.5	1.7
HEYDON R.		17.0	8.0	3.5	30.0	5.5	1.2	18.8	10.5	6.9
HOMATHKO R.		1.5	10.0	3.5	50.0	1.3	45.0	19.6	3.3	18.5
PHILLIPS R.		4.0	0.5	0.5	2.0	0.0	0.8	4.5	2.6	5.7
SOUTHGATE R.		75.0	95.0	80.0	150.0	125.0	100.0	36.2	6.7	8.2
STAFFORD-FRASER		1.0	N/A	0.0	N/O	N/O	0.3	1.4	1.4	1.2
VILLAGE BAY CR.		N/O	0.3	5.0	N/A	3.5	4.2	1.7	1.1	3.5
MISC.		11.9	11.3	10.5	2.3	14.1	3.4	4.8	6.6	7.9
TOTAL	150.0	117.9	125.1	103.1	234.3	149.3	159.8	94.3	33.8	55.0
MID VAN. IS.										
CAMPBELL-QUINSAM		8.7	4.0	0.6	N/A	2.0	6.0	5.1	1.3	2.4
COOK CR. (CHEF)		7.1	1.6	0.6	3.2	6.9	3.2	3.3	1.6	4.2
COUGAR CR. (COWIE)		0.3	0.2	1.2	0.1	0.6	N/O	0.3	0.8	4.2
ENGLISHMAN R.		2.5	2.5	0.2	1.7	0.4	4.0	4.8	3.6	8.1
FRENCH CR.		0.5	N/O	0.0	N/O	N/O	0.2	0.5	0.6	0.8
MCNAUGHTON CR.		0.3	0.5	1.0	0.6	2.1	0.7	2.5	0.9	4.8
NILE R.		0.1	N/O	0.1	N/O	0.1	0.0	0.1	0.3	0.3
OYSTER R.		0.1	0.0	N/O	0.1	0.1	0.2	0.4	0.5	5.3
PUNTLEDGE R.		85.0	40.0	75.0	75.0	82.0	20.0	40.6	34.3	33.0
BIG QUALICUM R.		105.7	92.2	130.0	116.0	82.0	93.2	113.3	55.5	41.0
LITTLE QUALICUM R.		152.6	78.0	55.0	70.0	30.0	60.0	53.7	42.5	43.0
ROSWALL CR.		1.4	0.5	2.0	1.0	1.8	5.0	1.2	1.8	3.3
TSABLE R.		1.0	2.0	2.0	1.1	8.6	6.2	4.9	6.5	7.9
TSOLUM R.		0.2	0.1	11.0	0.5	11.0	1.0	0.1	0.8	0.6
WATERLOO CR.		0.1	0.1	0.2	0.1	0.5	0.5	0.4	0.6	1.6
WILFRED (COAL)		0.3	0.1	0.7	0.1	1.5	1.4	1.0	0.9	1.3
MISC.		4.6	0.1	2.4	0.2	1.3	1.5	1.5	1.0	1.8
TOTAL	299.0	370.4	221.8	281.8	269.7	230.8	203.1	233.7	153.4	163.1

Appendix F. (cont'd)

SUBAREA - RIVER	CAPACITY	1985	1984	1983	1982	1981	1980	1970-79 AVERAGE	1960-69 AVERAGE	1950-59 AVERAGE
LOWER VAN. IS.										
BONSALL CR.		0.3	0.3	0.5	N/A	0.1	1.2	0.8	0.3	2.7
BUSH CR.		5.6	10.5	3.1	1.7	1.3	1.3	2.4	2.3	5.4
BONNELL CR.		18.9	8.6	1.6	3.2	5.5	N/A	2.9	2.2	7.0
HOLLAND (103ND) CR		10.5	8.5	8.0	3.3	1.3	1.5	2.9	4.6	7.0
NANAIMO R.		50.0	42.0	46.4	45.0	35.0	50.0	35.2	20.1	48.8
NANOOSE CR.		4.8	7.0	6.0	1.5	2.3	3.0	6.0	1.0	2.3
STOCKING LAKE CR.		5.0	8.7	4.6	1.0	2.7	3.0	3.0	1.7	3.6
WALKERS CR.		0.2	1.2	1.3	N/A	0.4	0.6	0.5	0.3	1.6
MISC.		0.5	0.0	1.5	1.0	0.4	0.0	0.1	0.1	0.2
TOTAL	147.4	95.7	86.7	72.9	56.7	48.9	60.6	53.8	32.6	78.4
SOUTHERN VAN. IS.										
CHEMAINUS R.		40.0	35.0	25.0	43.6	22.7	15.0	13.2	9.2	37.6
COWICHIAN R.		190.0	75.0	70.0	110.0	70.0	110.0	63.1	55.5	59.0
GOLDSTREAM R.		16.5	21.0	14.0	16.0	32.0	26.5	7.6	7.0	13.3
KOKSILAH R.		8.0	7.0	5.0	2.0	2.0	3.5	4.4	5.3	2.3
MISC.		-	0.0	1.5	1.0	4.0	2.0	2.3	0.8	4.0
TOTAL	238.5		138.0	115.5	172.6	130.7	157.0	90.5	77.7	116.2
HOWE SOUND - SUNSHINE COAST										
CHAPMAN CR.		0.3	0.2	0.4	0.0	0.6	0.5	1.8	0.1	N/A
CHEAKAMUS		130.0	50.0	20.0	20.0	40.0	60.0	34.0	19.3	19.8
MANQUAM R.		25.0	15.0	5.0	6.0	5.0	12.0	19.7	2.8	3.6
MCNAB CR.		1.2	2.0	0.3	0.5	1.5	1.2	0.6	0.2	0.3
ROBERTS CR.		2.0	6.5	1.5	0.1	0.2	1.2	1.2	1.3	N/A
SQUAMISH R.		160.0	50.0	50.0	100.0	75.0	150.0	63.5	16.8	44.3
WAKEFIELD CR.		0.2	0.6	0.3	N/O	0.1	0.2	0.5	N/A	0.2
WEST BAY CR.		0.7	0.3	1.5	0.5	1.5	0.9	1.3	0.4	N/A
WILSON CR.		0.4	0.5	0.4	0.0	0.1	0.3	0.2	N/A	N/A
MISC.		53.8	31.1	7.1	6.6	6.2	5.5	8.5	1.8	1.1
TOTAL	350.0	373.6	156.2	86.5	133.8	130.2	231.7	131.1	42.5	69.3
BURRARD INLET										
INDIAN R.		30.0	30.0	26.0	24.0	17.5	15.0	16.4	5.9	14.8
MISC.		0.6	1.0	1.1	0.4	1.4	0.5	0.7	0.1	2.3
TOTAL	50.0	30.6	31.0	27.1	24.4	18.9	15.5	17.0	6.0	17.2

Appendix F. (cont'd)

SUBAREA - RIVER	CAPACITY	1985	1984	1983	1982	1981	1980	1970-79 AVERAGE	1960-69 AVERAGE	1950-59 AVERAGE
FRASER RIVER										
NEW WEST-DOUGLAS IS.		66.2	31.0	20.5	25.2	23.4	13.2	11.6	2.6	8.7
DOUGLAS IS.-MISSION		119.7	29.4	42.1	28.1	42.1	24.6	52.0	46.6	7.3
HATZIC SLOUGH		7.4	11.1	7.1	2.2	4.0	2.7	0.9	0.4	0.6
NICOMEN SLOUGH		17.6	31.5	9.8	12.3	25.2	14.5	10.9	4.3	3.9
HARRISON LAKE		11.4	3.1	10.1	18.4	0.6	0.2	0.2	0.2	0.3
HARRISON RIVER		501.0	30.95	230.4	156.3	235.5	158.7	182.8	124.6	67.1
VEDDER-CHILLIWACK		154.4	102.7	39.9	71.0	93.2	94.0	75.7	70.5	26.6
CHILLIWACK HOPE		7.8	4.9	2.1	1.7	1.4	0.8	1.5	1.0	1.2
ABOVE HOPE		0.6	0.3	0.0	0.0	0.1	N/A	0.0	0.0	0.0
MAINSTEM FRASER		15.1	9.6	3.0	5.0	9.8	3.5	0.7	69.5	0.0
MISC.										
TOTAL	700.0	901.2	533.0	365.0	320.3	435.3	312.1	336.3	319.7	115.7
BOUNDARY BAY										
L CAMPBELL R		0.3	0.8	0.4	0.2	0.1	0.2	0.2	0.0	0.4
MISC.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.0	0.3	0.8	0.4	0.2	0-.1	0.2	0.2	0.0	0.4
GRAND TOTAL	2729.1	2459.0	1564.4	1193.3	1415.0	1292.1	1311.0	1181.6	890.5	1065.8

N/O = none observed

N/A = not available